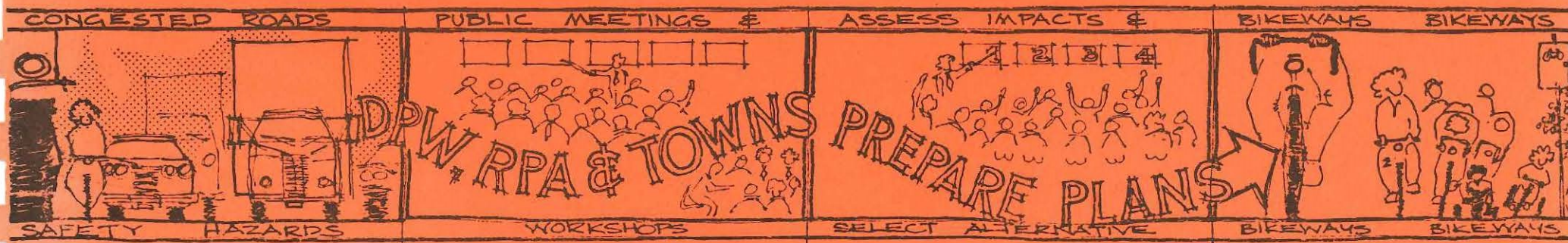


BIKEWAYS IN MASSACHUSETTS



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

Supported by a grant from the Massachusetts Department of Public Works, the aim of this study is to document the procedures developed for bikeway planning in this state. However, it is my hope that this study will serve as a focal point in the decisions affecting our common future.

This report is designed not only as the fulfillment of an assigned list of contract tasks but as a springboard for discussion and as an aid to the resolution of our growing transportation problems.

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Gustave D. Olson, Jr.
Project Director
Bikeway Study Team

May, 1975

CREDITS

This report was produced under a contract between the Massachusetts Department of Public Works, Bureau of Transportation Planning and Development, and the University of Massachusetts, Institute for Governmental Services. The contract was administered by Dr. Paul Shuldiner. The Highway Corridor Land-Use Planning section, of which the bikeways project was part, was coordinated through the Department of Landscape Architecture and Regional Planning by Dr. Ross S. Whaley and Dr. Julius Gy. Fabos. Kathie Davis Marotta of the DPW served as liaison between the Bureau of Transportation Planning and Development and the UMass Bikeways Study Group, the members of which are responsible for this report.

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COMMONWEALTH OF MASSACHUSETTS

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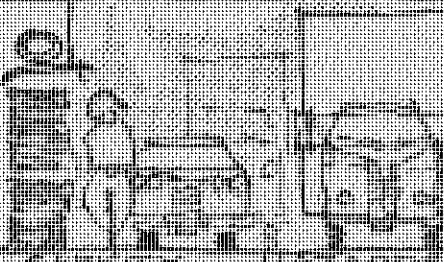
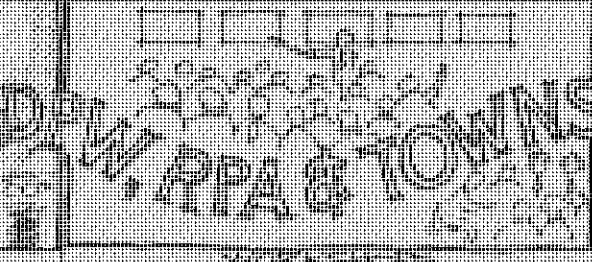
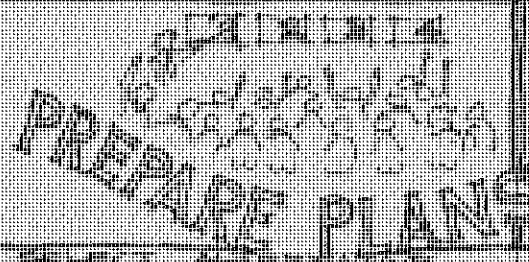
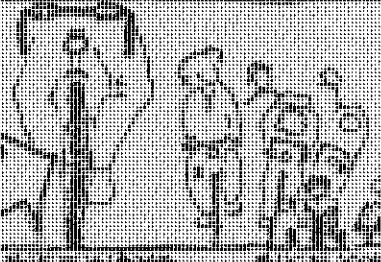
GRAPHICS COORDINATOR: Christopher Wren

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STAFF: Kathie Davis Marotta

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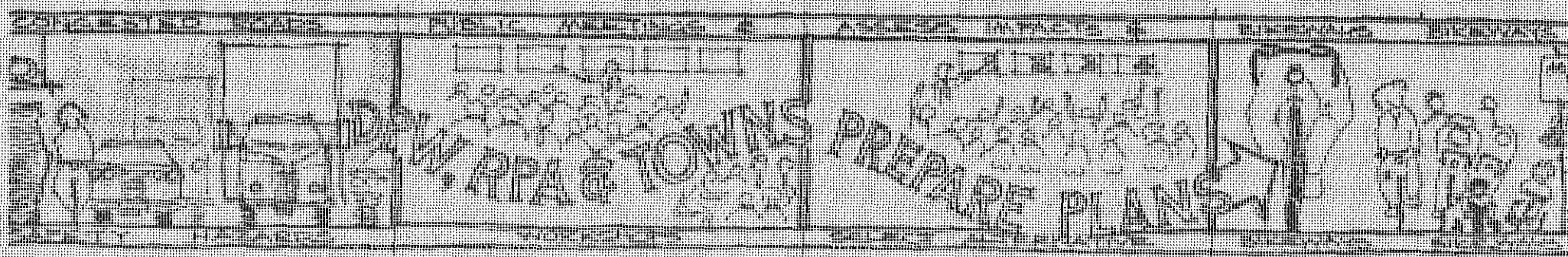
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	E. UMASS/DPW Bikeways Planning Publications
	1. Bikeways: Definition
	2. The DPW Bikeways Planning Process
	3. Bikeways: Funding
	4. Bikeways: Design Standards
	5. Bikeways: Demand Determination
	F. UMASS/DPW Bikeways Inventory
	G. Bikeways Inventory Conducted by the DPW (1974). Bikeway Inventory for Massachusetts compiled by the Bicentennial Commission.
	H. DPW State Bikeways Plan (1975)

I. UMASS/DPW Contacts List (A list of individuals
and firms who contributed to this study).

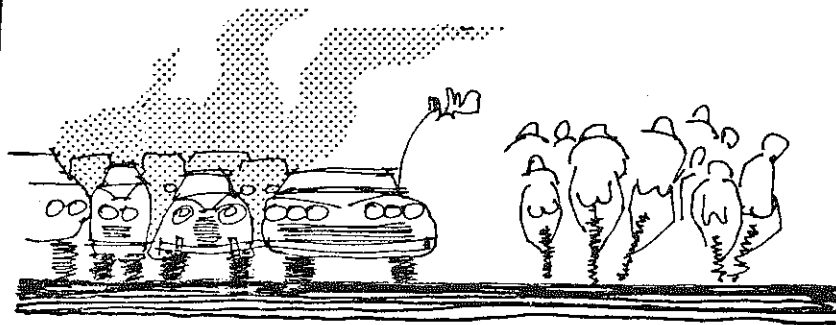
INTRODUCTION



INTRODUCTION

THE NEED FOR BIKEWAYS

In recent years there has been an increase in the use of bicycles as a form of transportation for both recreational and commuter purposes. Over the last decade sales have increased dramatically; in fact since 1973 bicycle sales have been greater than automobile sales. Today there are an estimated 70 million bicycles in use in the United States, compared to 100 million automobiles. With increased usage there has also been a significant increase in the number of automobile/bicycle accidents. Primarily, this is due to few provisions being made for bicycles; either in the form of facilities or in safety education programs and road safety regulations. The provision of facilities for automobiles and bicycles is not commensurate to the numbers of people in each user group.



100 MILLION
AUTOMOBILES
IN THE U.S.A.

70 MILLION
BICYCLES
IN THE U.S.A.

SAFETY PROBLEMS

As direct result of increased bicycle usage and increased safety problems, there has been a dramatic increase of interest in planning bicycle facilities. The DPW has accepted the responsibility for planning bikeways in Massachusetts. In addition to suddenly having this work thrust upon them, the DPW has recently adopted a planning method (as outlined in the Massachusetts Action Plan, 1974) which is aimed at developing comprehensive transportation plans on the regional level. Obviously, to incorporate such an approach into their

existing planning process will take time. Faced with these upheavals and an almost overwhelming demand for bikeways, bikeway planning and bikeway planning information, the DPW has developed an interim planning method. This will be used until a more appropriate process can be developed which complies with the Action Plan.

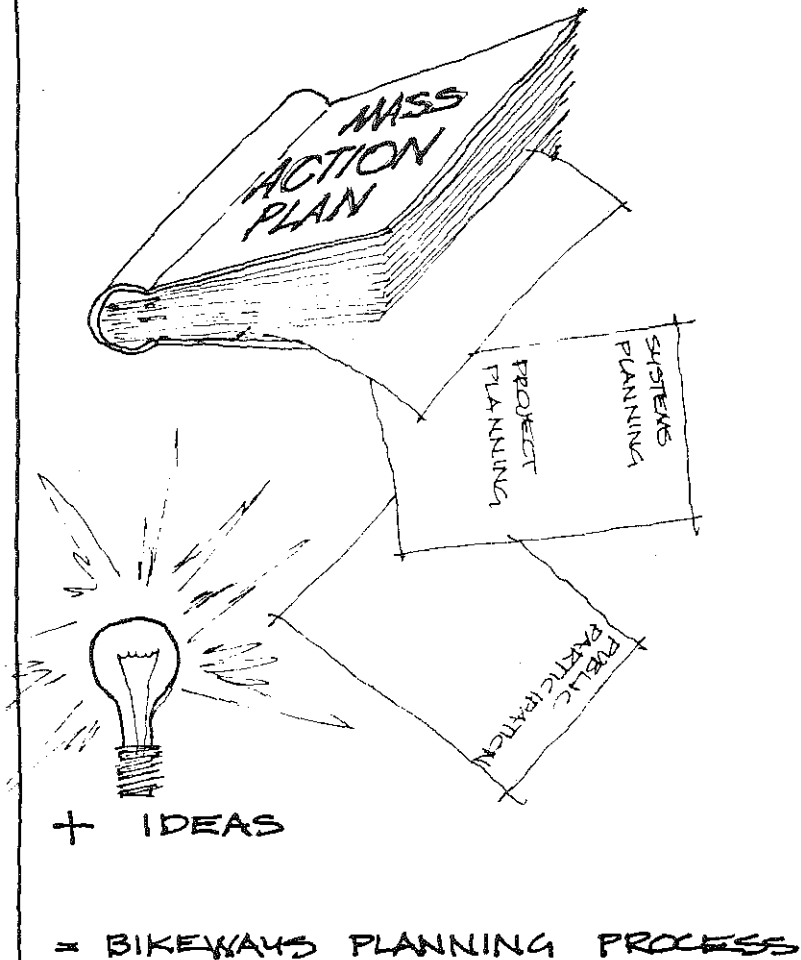
The initiation of this contract and the DPW's stated aim of incorporating bikeways planning into their overall transportation planning process is a reaffirmation of their desire to provide facilities for all road users and a recognition of the extensive use of bicycles as a form of transport in this state.

RATIONALE OF THE PLANNING PROCESS

The major emphasis during this year was on the development of a bikeways planning process or model, which was derived from current DPW planning practices and the Massachusetts Action Plan (1974). This work was a cooperative effort that involved DPW and UMass personnel, who together assessed the needs of the towns in Massachusetts and established the goals for this study and the planning process.

In essence, the process is aimed at:

1. Increasing the facility, convenience, pleasure and safety of all road users by providing appropriate bicycling facilities whether they be for recreational or commuter use.
2. Developing comprehensive bikeway plans which respond directly to demand and complement other transportation systems.
3. Contributing to regional development and town plans.
4. Making accessible and apparent historic, recreational, scenic and cultural resources.
5. Protecting, and where possible, enhancing the natural and cultural environment.



The anomalous relationship between the scale of bicycle transportation and regional planning was resolved by developing a process which involves governmental units responsible for planning on a local level (i.e., the towns), to supplement the work of the RPA and DPW whose planning efforts are directed more at the regional level. In this process, each group has its own particular role thus saving duplication of effort and pooling the available resources.

PUBLIC PARTICIPATORY COMPONENT

The public participatory component parallels the Massachusetts Action Plan and, to some extent, dictates the process used in analyzing and synthesizing the data. Wherever possible, techniques were employed that would be easily comprehended by the general public. For example, in assessing the demand, mathematical modelling was considered but discarded in favor of a simple mapping technique which provided a graphic tool for analyzing the demand statistics.

The citizen advisory groups established as part of the process, serve as informed advocates for their communities by virtually becoming consultants to the DPW or members of the planning team. Together with the town officials, they are responsible for collecting much of the data and contribute to the decision-making process by assisting with the formulation of goals, determining priorities and developing preliminary plans. Involving citizens in the planning process, in this way, provides a useful workforce and the necessary liaison between the towns and the DPW.

Planning for a particular mode of transportation cannot be considered an independent activity but must be thought of as part of the overall scheme of things, contributing to the well-being of the populus. Indeed, state and federal law ensures this by requiring environmental impact statements for all state and federally funded projects, which are intended to monitor the social, environmental and economic consequences of any contemplated action. It is obvious then that the shortest most easily constructed route, utilizing the cheapest available land, will not necessarily be the most

suitable. Plans developed with only the costs of these initial expenditures in mind may engender unanticipated long term environmental and social costs.

The planning methodology responds to this by initially considering environmental, social and economic factors and tests in a preliminary way the suitability and impacts of proposed routes prior to an extensive commitment of funds and expertise.

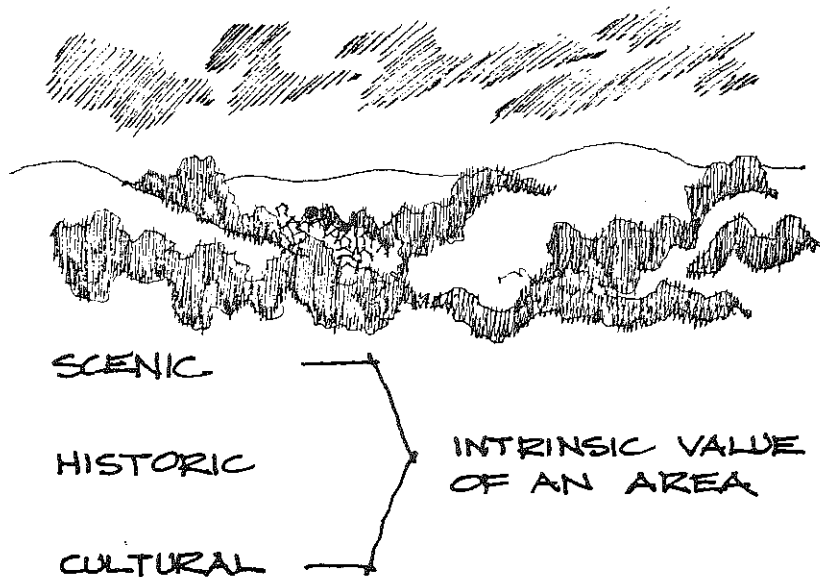
To formulate goals for a particular study area, it is necessary to understand the problems related specifically to bicycle transportation, general development trends in the area, and the specific constraints and opportunities that exist. The intrinsic value of a region is a matrix of scenic, historic and cultural resources. One or more of these factors may dominate depending on its local, state or national significance. These must be considered if the full potential of any development is to be realised.

Therefore, in attempting to provide for these needs a multi-faceted model has been developed which provides:

1. A mechanism for implementing the planning method via a public participatory process.
2. A public informational component with the publications necessary to inform the public about bikeways and the DPW Bikeways Planning Process.
3. A route selection method for determining what McHarg calls "the least social cost corridor" or, more explicitly, determining the route with fewest social costs which is most beneficial for the greatest number of people. This method responds to the demand and provides a preliminary impact assessment procedure for the proposed routes.

Structure of the Model

In the description of the planning model, the information flow may become obscured by the complex interaction between the various components of the process. However, it is



basically very simple and may be summarized as follows: (see Figure 1).

1. The DPW, RPA and towns, with the assistance of a citizen advisory group, assesses demand, evaluates existing transportation systems, and conducts bikeway and resource inventories.
2. Goals are established, high priority routes identified, and the preliminary impacts of these routes assessed.
3. The DPW synthesizes the data into several alternative proposals and enumerates the advantages and disadvantages of each proposal. Benefits are taken into account by considering the population served by each proposal and the influence on other transportation systems, the towns and the environment. Project costs are a product of the proposed length of bikeway, its physical characteristics, construction difficulties (due to natural and physiographic constraints) and land acquisition costs.
4. Alternative implementation procedures are determined.
5. Feedback is obtained from the general public via workshops and meetings held in the study area and from the necessary reviewing agencies.
6. A proposal is selected and state and federal approval is sought.
7. When funds are approved, the DPW proceeds to the Engineering Design Phase to develop detailed plans and cost estimates for the parts of the plan for which they are responsible. During this phase of the work frequent consultation with the communities involved is necessary to assure that the intention of the original plans are accurately translated into detailed drawings.

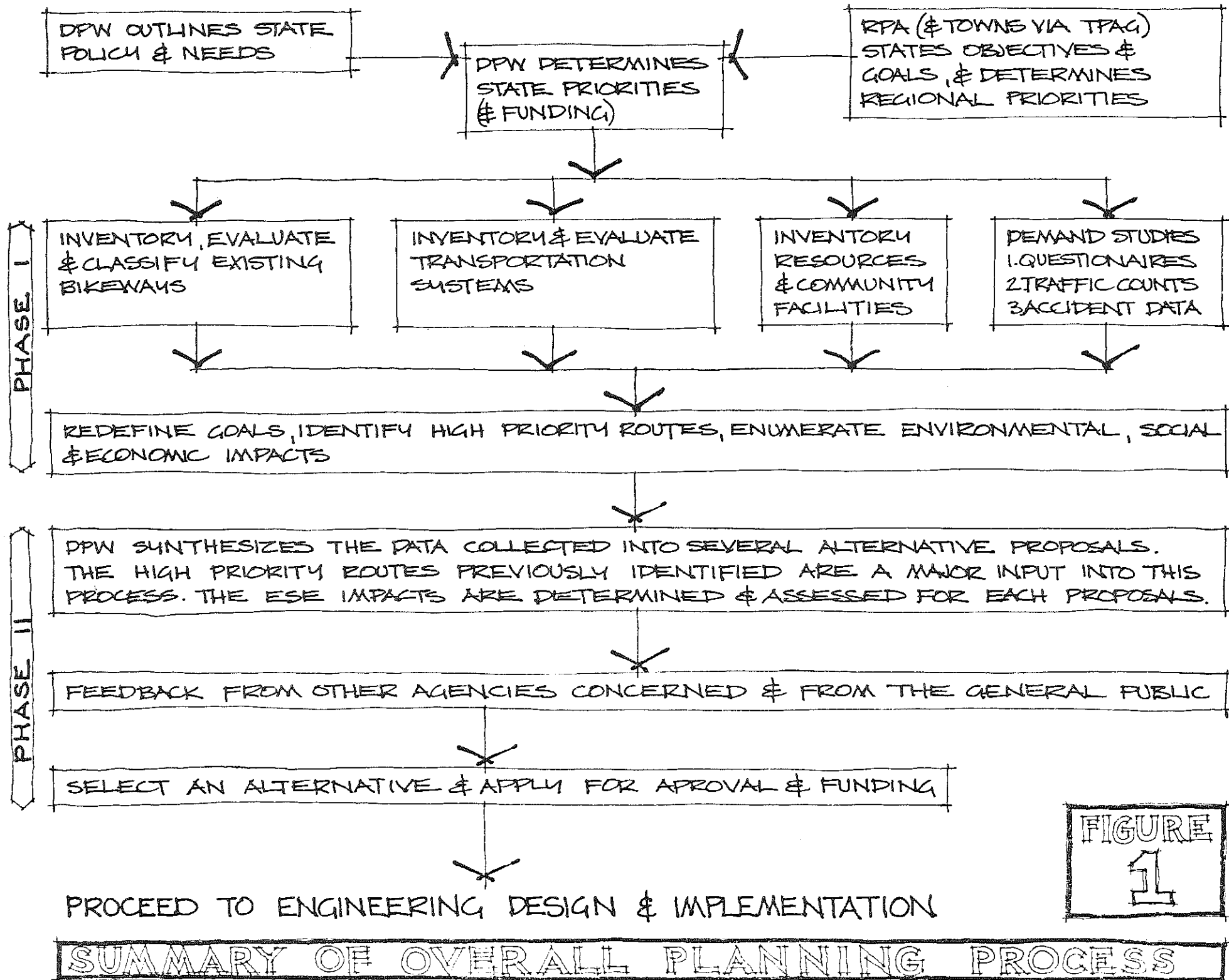


FIGURE
1

A WORKBOOK FOR THE DPW

It should be realized that many facets of the model remain untested (e.g. synthesis submodel). These can be developed to their full potential and expounded upon through their application to a demonstration project in subsequent years of the contract.

ORGANIZATION OF THIS REPORT

This report is in the form of a workbook which describes the procedures that have been developed and were used for all facets of the study. However, due to the scope of the problem, it has not been possible to justify all the procedures used, or to describe how many parts of the model were developed.

There are five chapters. Chapter one is an introduction to the report. Chapter two provides a brief overview of bike-ways planning in America. The informational brochure Bikeways: Definitions is included as it provides a discussion of the relative merits of different types of facilities and relates the planning process to physical design. Chapter three provides a discussion of the two

FIVE CHAPTERS

1. INTRODUCTION.
2. STATE OF THE ART
3. DPW BIKEWAYS PLANNING PROCESS
4. DEMONSTRATION PROJECT
5. RECOMMENDATIONS & CONCLUSIONS

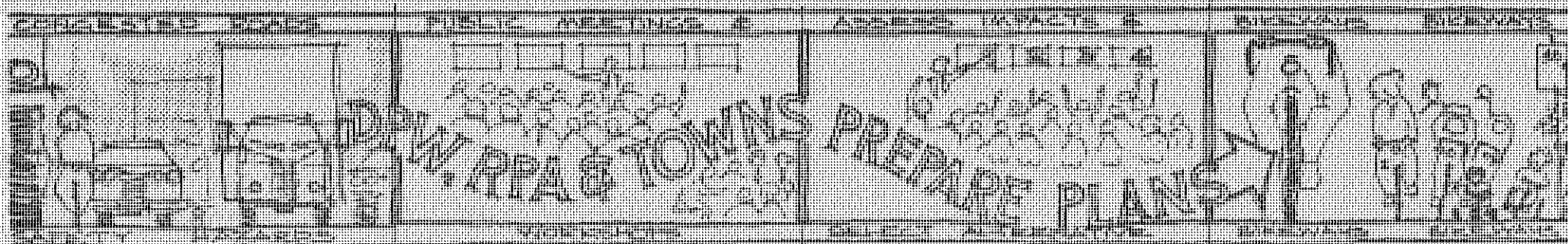
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phases of the DPW Bikeways Planning Process. Included in this chapter is a description of the Synthesis Submodel, a component of the phase II procedures. Chapter four provides a description of the work that has already been undertaken in applying the planning process to a demonstration area and recommends actions for future phases of the work. Chapter five provides a discussion of the problems inherent in bikeways planning in Massachusetts. Recommendations are made to mitigate these problems and a program is suggested for future phases of the study.

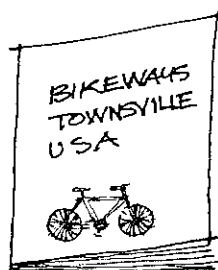
STATE OF THE ART

This chapter provides a brief introduction to the major issues of interest and concern to bikeway planners in this country. The recent upsurge of interest in bicycling has been paralleled by an equally impressive increase in the amount and quality of published material dealing with bicycle-related issues. A thorough review of even the major reports cannot be presented here, since it is beyond the scope of this report. However, many of the problems identified and specific techniques employed in other studies have been adapted for use in the DFW Bikeways Planning Process. Reports referenced in the text represent those studies addressing the issues covered in this review. Numerous other examples could have been cited and are included in the attached bibliography.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '78



GENERALLY CONSIDER SIMILAR
FUNDAMENTAL BIKEWAY PLANNING
& CONSTRUCTION ISSUES

THE STATE OF THE ART

The bikeway planning studies conducted to date have generally recognised the duality of bicycle usage. Although the majority of studies consider both recreational and utilitarian/com-muter uses, they reflect the specific concerns of the project area. Thus, while the approach in Davis, California provides primarily for commuter/utilitarian uses, the Bart/Trails (1974) report emphasizes the recreational potential of the study region in addition to maximizing the potential of an existing commuter rapid transit system.

Planning studies have been initiated at all levels of government. Community based studies have tended to be project oriented, while state and federally sponsored publications have emphasized planning strategies and generic considerations. Regardless of the type of study each report usually includes consideration of similar fundamental bikeway planning and construction issues. Included in the majority of these reports are:

1. Justification of the study by a reference to the increased use of bicycles. Some reports (e.g. U.S.D.O.T. and D.O.I. Bicycling for Recreation and Commuting, 1972; and Jarrell T.R. Bikeways, Design - Construction - Programs, 1974) discuss the history of bicycle transportation and recount developments in bicycle design and use.
2. Definitions of the basic types of bicycle facilities. Terminology is by no means standard but the majority of studies allow for physically similar types of facilities. For Massachusetts these are described in the UMass DPW publication entitled Definitions and their Implications which is included at the end of this chapter.
3. Consideration of prevailing climatic or geographic conditions, which may influence the recommendations and proposals developed in the study. Obviously, demand will vary during different times of the year in relation to the prevailing seasonal conditions.

4. Discussion of the factors used to determine the location of bikeway facilities. Origin - destination information gathered from community questionnaire surveys, traffic counts, and accident data are used to quantify demand. This information serves to demonstrate public support and to justify a specific proposal for funding purposes.

In the Tempe Bikeway Plan (1974) evaluation of the completed facility is stressed to determine its design performance and influence on cycling patterns in the community.

5. Recommendations for design standards. Bikeway Planning Criteria and Guidelines (Institute for Transportation and Traffic Engineering, 1972) was for a time the definitive text on bikeway design. The design criteria sections of many reports are clearly derived from this report. However, design evaluation and further study has since made necessary the revision of some of these standards. The DOT/FHWA report entitled Bikeways State of the Art (1974) identifies some of the major problems with current design practices and recommends appropriate standards for future work.

Design Standards (UMass/DPW, 1975) provides suitable design standards for Massachusetts (see Appendix F). This report includes consideration of bikeway dimensions, clearances required, grades, radii of curvature, design speed, drainage, base and surface material, signing and maintenance.

Further detailed information can be obtained from the U.S.D.O.T. publication Planning for the Bicycle as a Form of Transportation (1974).

6. Discussion of the supporting programs necessary for the implementation of a bikeway program. Safety education programs being of paramount importance are generally considered. In the report for San Louis Obispo, California a valuable discourse on this topic is presented. (U.B.D.C. Bikeways Atlas, 1975).

7. The level of detail in planning proposals varies from

recommendation for future study to detailed sketch design and siting considerations.

In addition to the information previously mentioned some reports also describe the planning process through which their proposals were developed. In most cases the procedure used was a direct and pragmatic approach to problem solving. These processes though implicit and usually sound were never presented as a comprehensive decision making process. The major limitation of undocumented processes is the difficulty of understanding the various components and their interaction in the decision making process. As a result the basis for making many of the decisions is not apparent and the procedures are not easily adapted to other studies. However a discussion of systems analysis as applied to bikeway planning is included in the D.O.T. publication Planning for the Bicycle as a Form of Transportation (1974).

A majority of the reports based their route selection decisions solely on demand data. Although this is undoubtedly one of the major determinants in route selection other factors such as accessibility to scenic, cultural and historic resources should also be considered. In addition route selection decisions should reflect a consideration of topography, the environmental quality of the proposed corridors and other physical design limitations.

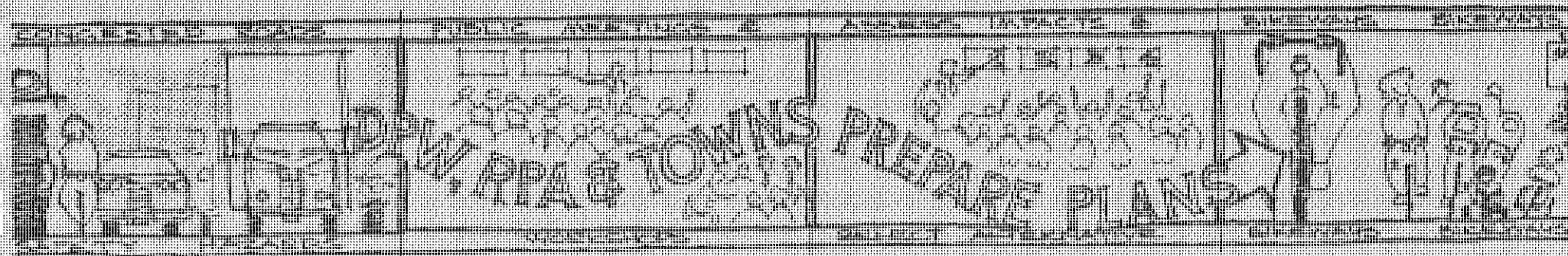
An unusual aspect of bikeway planning is the level of public interest generated by this issue. Generally the impetus for bikeways development has come from ad hoc community groups who are willing to contribute considerable time and effort to the realization of their proposals. The Tempe Bikeway Plan (1972, 1973, 1974) documents a public participatory process of this type.

To provide additional background information to supplement the above state of the art review the UMass/DPW bikeways publication Bikeways: Definitions is included in this chapter.

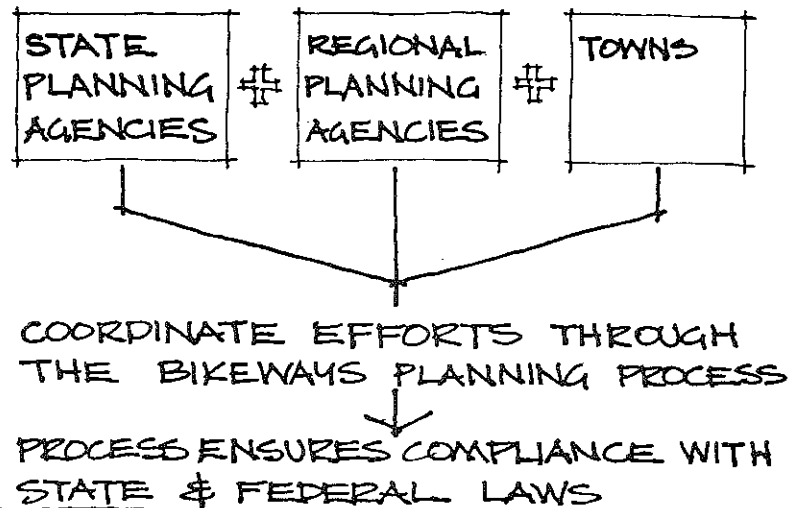
UMASS/DPW PUBLICATION
BIKEWAYS: DEFINITIONS
 IS INCLUDED IN THIS CHAPTER
 TO PROVIDE BACKGROUND
 INFORMATION ABOUT BIKEWAYS

THE BIKEWAYS PLANNING PROCESS

This chapter provides a description of the two phases of the Bikeways Planning Process and their relationship to the Massachusetts Action Plan (1974). The Action Plan provides the framework for all BFW work. A summary followed by a detailed description of each phase is presented. The Synthesis Submodel, which is part of Phase II and is the process used to develop alternative bikeway proposals, is also discussed.



THE BIKEWAYS PLANNING PROCESS



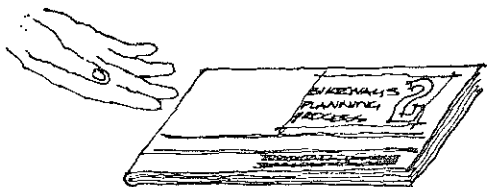
The planning process developed attempts to use the resources of the towns, regional planning agencies, and state agencies in an efficient way by avoiding duplication of effort through the coordination of plans on a regional level. Basically, its purpose is to enable the D.P.W. and R.P.A. to assist towns in preparing and implementing bikeway plans and to ensure compliance with planning requirements and laws which apply when federal and/or state funding is involved. The process capitalizes on the high level of interest shown by local community groups and town officials in bikeways planning, by charging them with the responsibility for gathering basic data, establishing goals and making planning recommendations. The D.P.W. and R.P.A. act as facilitators of this process by providing the necessary tools, technical information and expertise, and are responsible for synthesizing the information into detailed proposals.



Basically, the planning process is guided by the D.P.W., coordinated by the R.P.A. and involves local officials and interested citizens likely to be affected by the proposal. These groups interact through a series of meetings and workshops. The meetings are generally informational and are aimed at explaining the various phases of the planning process. Much of the actual work is done in workshops; here, methods of gathering information are discussed, specific problems and opportunities are considered, goals are established and the implications of the various alternative proposals are analyzed. Therefore, it is important that a reliable task force of citizens is involved to ensure that responsible decisions are made. The task force or Bikeways Advisory Group (BAG), need not be cyclists or have any particular skills, apart from an interest in their community and a desire to improve it. However, members of the BAG must be representative of the community and be willing to devote their time to attending the various meetings and workshops involved. Suggestions for the composition of the BAG's are included later in this report.



STATE & REGIONAL PRIORITIES DETERMINE PROJECTS TO RECEIVE STATE & FEDERAL AID

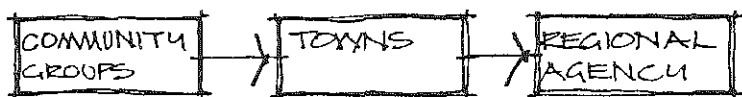


PROVIDE TOWNS WITH THE D.P.W.
BIKEWAYS PLANNING PROCESS

State and federal aid is provided on the basis of regional and state priorities. As the R.P.A.'s are responsible for planning on a regional level and hence for establishing regional priorities, applications for assistance must be directed through them. Therefore, towns should contact the R.P.A.s early in the planning process, and through them, initiate the procedures for state and federal aid. In addition, the R.P.A.s will provide towns with guidelines for their initial planning work.

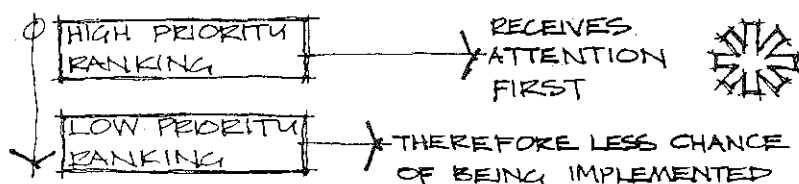
To inform the towns (and R.P.A.s) of their responsibilities in this regard, the UMass Bikeways Study Group, on behalf of the D.P.W., has produced The D.P.W. Bikeways Planning Process. This publication is directed at the towns and, therefore, assumes that they take the initiative; however, planning actions may also be initiated by the R.P.A.s.

It is not mandatory that a town comply with the D.P.W. Bikeways Planning process. Some towns may choose to develop their bikeways using local resources only. However, if it is likely that state or federal aid will be requested, complying with the process will ensure that all requirements are met. The procedure is as follows:



RPA PROVIDES PLANNING & DESIGN
INFORMATION TO THE TOWNS

TPAG & RPA DETERMINE REGIONAL
PRIORITIES

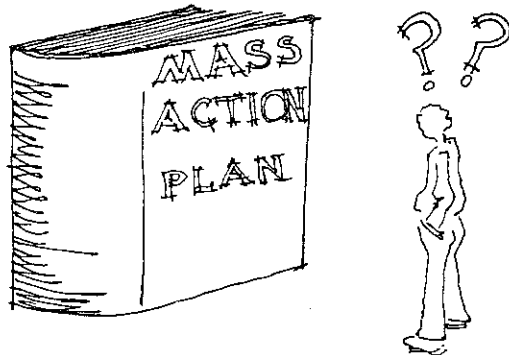


1. Towns interested in developing bikeways systems should contact their regional planning agency for assistance and guidance (community groups interested in bikeways should channel their efforts through town officials).

2. On request, the R.P.A. will provide basic planning and design information and assist the towns wherever possible to provide adequate data to enable the Transportation Planning Advisory Group (T.P.A.G.) to judge the relative merits of a proposal.

3. Once the towns provide the necessary information to justify their proposals, the TPAG, assisted by the RPA, assigns the project a priority and applies to the D.P.W. for assistance.

4. The D.P.W. will provide assistance to projects based upon the priority ranking. A project with a high priority ranking receives attention first and, therefore, has a good chance of being implemented. As resources for state projects are limited, low priority items have less chance of being implemented.

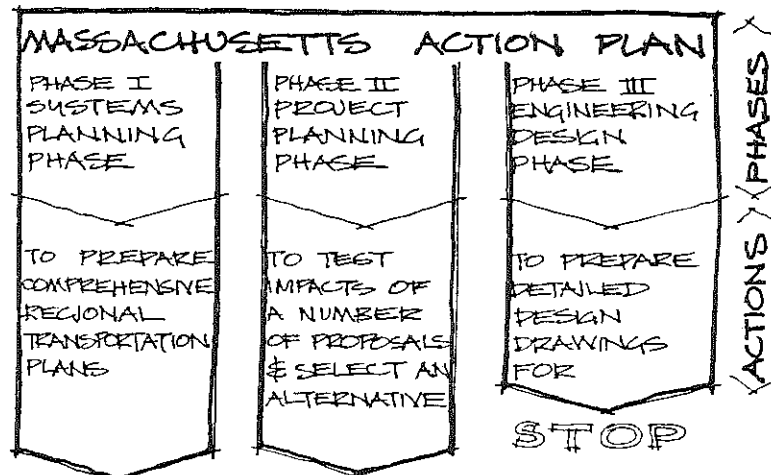


MASSACHUSETTS ACTION PLAN IS COMPLEX
& NOT FULLY IMPLEMENTED

When the D.P.W. becomes involved in a project, it is required to follow the planning process described in the Massachusetts Action Plan (1974). The Action Plan is a document developed partly in response to Federal Highway Administration requirements whose goals are to ensure that transportation plans are coordinated on a regional level, are responsive to local needs, and consider the environmental, economic and social impacts likely to be incurred. However, it will take time to completely implement all phases of this plan as it involves complex procedures and years of data gathering, research and planning.

BIKEWAYS PLANNING PROCESS (MODEL)
IS BASED ON THE MASS ACTION
PLAN

Prior to describing the Bikeways model, it is necessary to briefly assess the current status of the Action Plan. Essentially, there are three phases to the Plan: The System Planning Phase, the Project Development Phase, and the Engineering Design Phase (see Figure 2). This study is concerned with the first two planning phases.

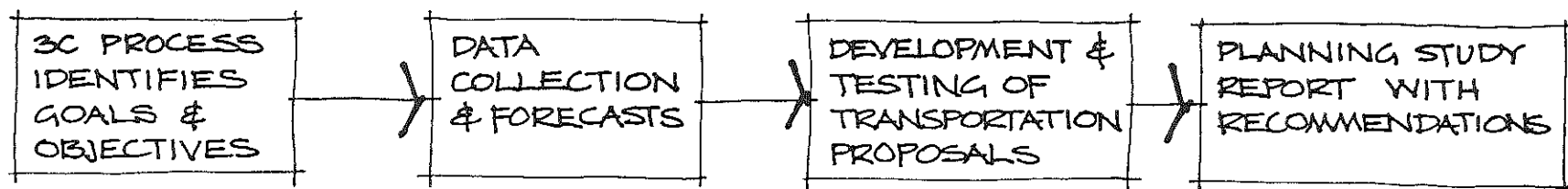


THIS STUDY IS ONLY CONCERNED
WITH THE FIRST TWO PLANNING
PHASES OF THE ACTION PLAN

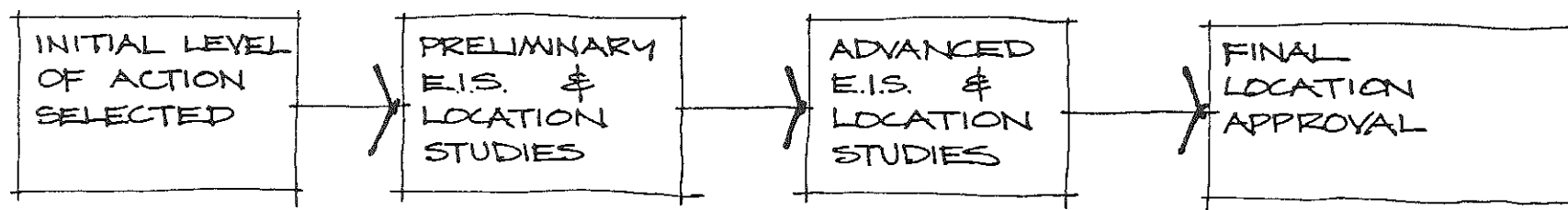
COMPLEXITY OF PROJECT DETERMINES
PLANNING ACTION IN PHASE II

The Systems Planning phase was developed to overcome the current piecemeal development procedure by producing comprehensive transportation plans for each region. Essentially, it is aimed at testing the impacts of a number of alternative transportation systems and establishing regional priorities. Unfortunately, this part of the Action Plan is not fully implemented. Obviously, each region has not reached the same level in its planning efforts but generally, it can be said that of the four basic actions identified in Figure 2, only the first two are currently being implemented and then only in part. The 3C process is a cooperative planning process involving citizen advisory groups, regional planning agencies and the D.P.W. It is the method by which projects are currently assigned priorities and regional problems and goals are identified. Data collection is, of course, an ongoing process, in which all agencies are involved, which will require considerably more work before comprehensive regional plans can be developed.

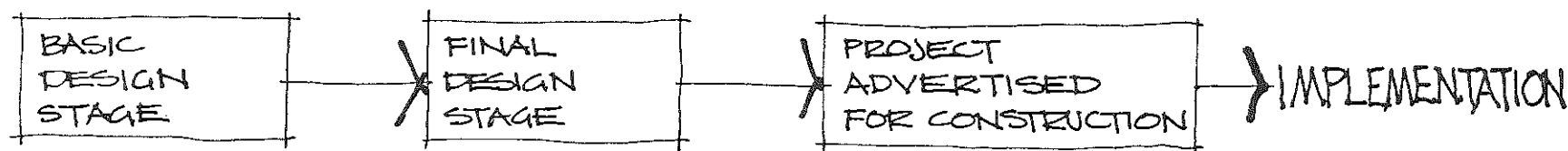
On the basis of the planning study report produced at the end of the Systems Planning Phase, a particular project is assigned a level of action, based upon the complexity and scope of the problem. The level of action then determines the planning process



SYSTEM PLANNING PHASE - PHASE I



PROJECT DEVELOPMENT PHASE - PHASE II



ENGINEERING DESIGN PHASE - PHASE III

FIGURE
2

SUMMARY OF MASS ACTION PLAN

MASSACHUSETTS ACTION PLAN

AT THE END OF PHASE I (SYSTEMS PLANNING) PROJECTS ARE ASSIGNED TO A LEVEL OF ACTION WHICH DETERMINES PLANNING PROCESS FOR PHASE II.

LEVELS OF ACTION

LEVEL I	LEVEL II	LEVEL III	LEVEL IV
---------	----------	-----------	----------

COMPLEX PROJECTS

RELATIVELY SIMPLE PROJECTS

STATUS OF THE ACTION PLAN

~~SYSTEMS PLANNING PHASE~~

~~PROJECT DEVELOPMENT PHASE~~

THEREFORE INTERIM PLANNING PROCEDURE IS REQUIRED AS A SUBSTITUTE FOR THE SYSTEMS PLANNING PHASE

RELATIONSHIP BETWEEN THE ACTION PLAN & THE BIKEWAYS PROCESS

ACTION PLAN	BIKEWAYS PROCESS
-------------	------------------

SYSTEMS PLANNING PHASE → PHASE I

PROJECT DEVELOPMENT PHASE → PHASE II

SUMMARY OF PHASE I OF THE BIKEWAYS PLANNING PROCESS

to be followed and the necessary environmental impact forms, reports and statements. For example, large highway projects which are likely to have major environmental, economic and social impacts are assigned a high level of action (Level I) which allows for adequate citizen reaction to the proposal and requires detailed environmental impact statements to be prepared. Conversely, with minor road improvements a relatively simple process is involved (Level IV).

Therefore, the current situation is such that the D.P.W. can implement the Project Development Phase, Phase II of the Action Plan, but requires input from the Systems Planning Phase (Phase I) to establish a reasonable planning procedure for Phase II. As a result, it has been necessary to develop procedures that will enable the Bikeways Planning Process to comply with the Action Plan and still be suitable for planning in the immediate future.

The Bikeways Planning Model has two phases which correspond to the two phases of the Action Plan. Phase I is the interim phase, developed to provide information to supplement the data used to justify the regional priority ranking. On the basis of this information, the D.P.W. will determine the appropriate planning actions for Phase II. When comprehensive regional data have been gathered in the process of developing regional plans, the Phase I information gathering process will become obsolete.

The purpose of Phase II of the process is to explore in detail a number of alternative proposals in terms of the possible advantages and disadvantages to the community. As bikeways are anticipated to have little impact on the community, the evaluation procedure is expected to be relatively simple.

SUMMARY OF PHASE I OF THE BIKEWAYS PLANNING PROCESS

Phase I involves one meeting and two workshops.

1. The purpose of meeting one is to discuss the planning process, the roles of the various groups involved, and the need for, and composition of, the Bikeways Advisory Groups.

SUMMARY OF PHASE I OF THE BIKEWAYS PLANNING PROCESS

MEETING ONE

1. BIKEWAYS PLANNING
2. DPW PLANNING PROCESS
3. BIKEWAY ADVISORY GROUP

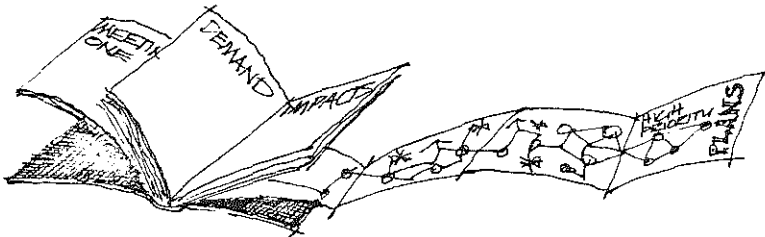
WORKSHOP ONE

1. DEMAND DETERMINATION
2. INVENTORIES

WORKSHOP TWO

1. REDEFINE GOALS
2. IDENTIFY HIGH PRIORITY ROUTES

RPA PREPARES SUMMARY OF PHASE I "PRELIMINARY BIKEWAYS PLANNING REPORT"



2. The purpose of workshop one is to discuss specific methods for determining demand and gathering inventory information.

3. The purpose of workshop two is to establish goals for the region or subregion, discuss specific opportunities and constraints to development, determine the major connections, and add local knowledge to base information generated by the D.P.W. and R.P.A.

A summary of all the meetings and workshops is prepared by the R.P.A. and is distributed to all participating groups. This is basically a preliminary environmental impact report with planning recommendations. The report is called the Preliminary Bikeway Planning Report. It includes consideration of:

1. Regional developments and plans.
2. The possible advantages and disadvantages of the proposals to the community (e.g., improved safety, loss of automobile parking, etc.).
3. The positive and negative environmental impacts.
4. The particular opportunities that exist (e.g., use of an abandoned railway right-of-way, improvement to traffic circulation, etc.).
5. Information generated by demand studies (e.g., traffic counts, accident data, demand questionnaires, etc.).

Figure 3 summarizes Phase I of the planning process.

SUMMARY OF PHASE II OF THE BIKEWAYS PLANNING PROCESS

SUMMARY OF PHASE II OF THE BIKEWAYS PLANNING PROCESS

On the basis of the Preliminary Bikeways Planning Report, the D.P.W. will determine the appropriate actions for Phase II of the process. This phase will vary in accordance with the scope and complexity of the problem; however, it will generally involve two public meetings and one workshop.

THE CURATOR



SUMMARY OF PHASE II OF THE BIKEWAYS PLANNING PROCESS

MEETING ONE 1. REVIEW OF PHASE I
2. PROCESS & SCHEDULE
FOR PHASE II

DPW SYNTHESIZES INFORMATION

WORKSHOP ONE 1. DISCUSS ALTERNATIVE
PROPOSALS

DPW & RPA PRODUCE THE SECOND
BIKEWAYS PLANNING REPORT



PUBLIC MEETING TO REVIEW ALTERNATIVE
BIKEWAY PLANS

JURISDICTION DETERMINED

1. The purpose of the first meeting is to summarize the findings of Phase I of the planning process and discuss the planning process for Phase II.

Following this meeting, the D.P.W., with the support of the R.P.A., synthesizes the information gathered during Phase I of the planning process. Several alternative proposals are developed on the basis of this information.

2. The purpose of the workshop is to discuss these alternative proposals and make appropriate recommendations.

The D.P.W. and R.P.A. then produce a second Bikeway Planning Report which is an elaboration of the preliminary report produced at the end of Phase I. In addition, this report documents the synthesis phase of the process, assesses the impact of the various proposals and includes the proceedings of the workshops and meetings. It is distributed to all groups involved in the process, including all reviewing agencies, and is made available to the public.

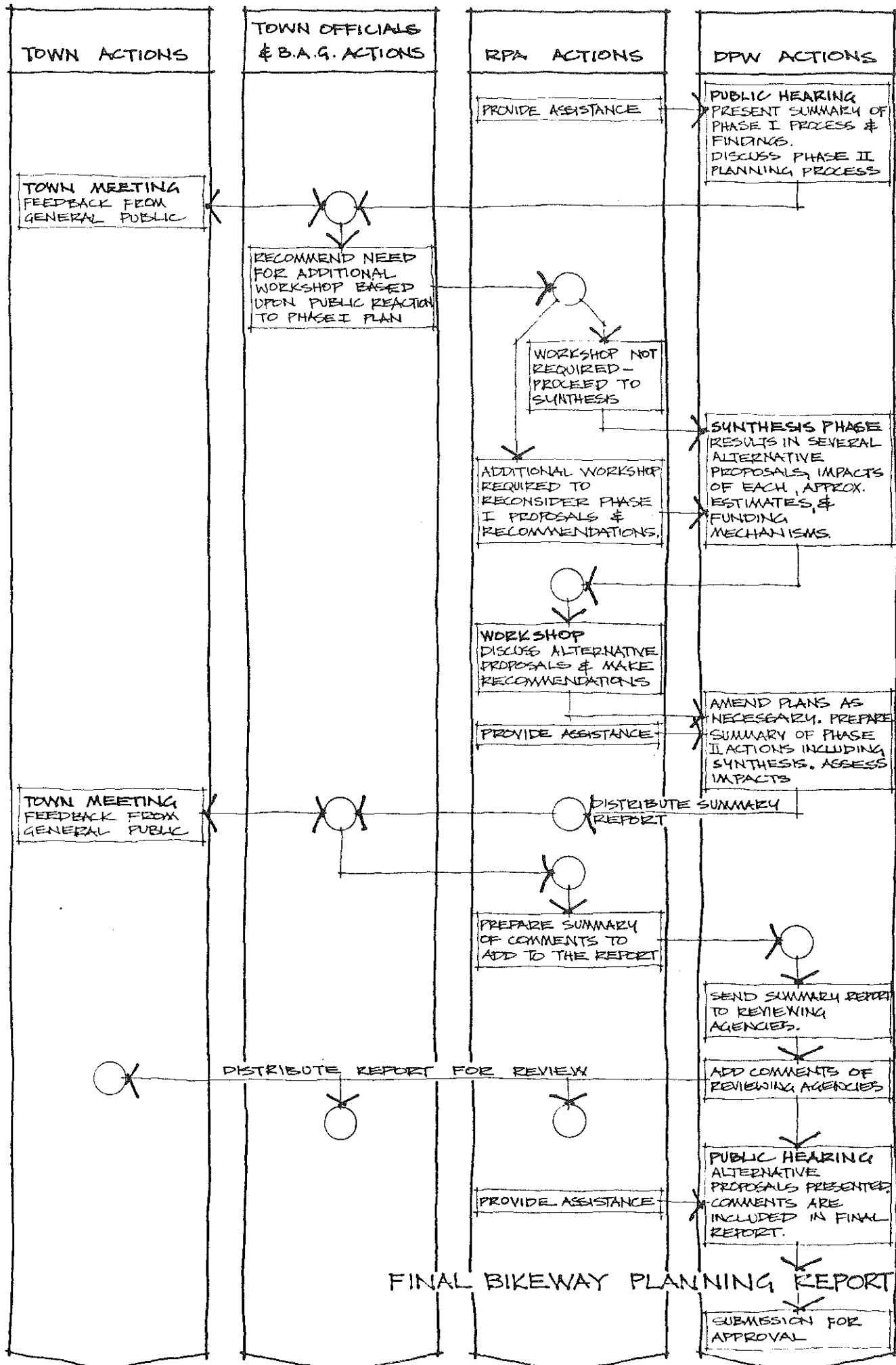
3. The purpose of the second meeting is to present the alternative proposals to the general public.

The proceedings of this meeting are recorded, reviewed and included in the planning report which is adopted as a Final Bikeways Planning Report. The D.P.W. then submits the report to the appropriate agencies for approval and, following this, a proposal is selected.

Once a proposal has been approved, detailed plans, working drawings and cost estimates are prepared. Since all parts of the proposed plan may not be under the same jurisdiction, the D.P.W. may not be responsible for preparing detailed plans for all parts of the system. These questions will have been resolved during the planning process and the various funding and implementation procedures determined for all parts of the plan. For example, if a section of a proposed route uses land managed by the Department of Natural Resources (e.g., forests, state parks, etc.), consultation during the process will have determined the various agencies' responsibilities.

Figure 4 summarizes Phase II of the planning process.

SUMMARY: PHASE III BIKEWAYS PLANNING PROCESS



FIGURE

4

DESCRIPTION OF EACH STEP IN THE PLANNING PROCESS

THE BIKEWAYS PLANNING PROCESS - PROCEDURES AND TECHNIQUES

The planning procedures involved in the Bikeways Planning Process are to be described in detail in the sequence in which they are applied. Therefore, this chapter is an elaboration of the planning process summary presented in the previous section, with a detailed explanation of each action involved. Processes that have been implemented or have been the subject of previous reports will not be dwelled upon. For example, Phase II of the model parallels the Project Development Phase of the Massachusetts Action Plan (1974), since, with the exception of the synthesis sub-model, it is described in detail in that document, there is no need to repeat it here.

The format for describing the procedure and techniques employed is as follows:

1. The major events in the process are identified.
2. The roles of the various groups involved are discussed.
3. Expected results are enumerated.
4. Items requiring detailed explanation are then elaborated upon.

BIKEWAYS PLANNING PROCESS - PHASE I

BIKEWAYS PLANNING PROCESS - PHASE I

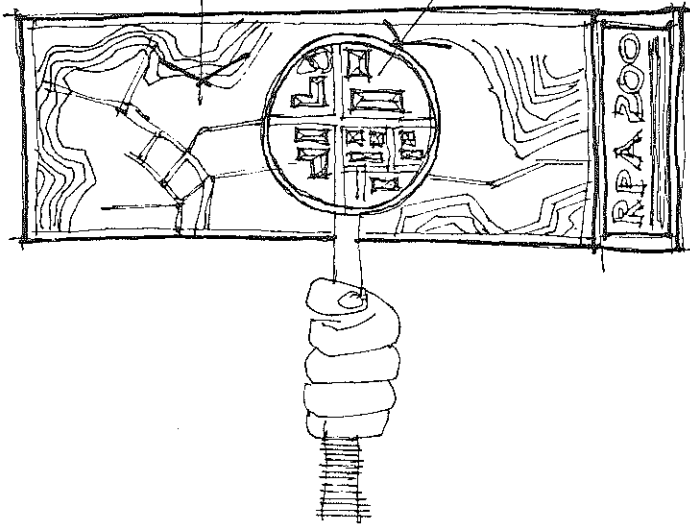
A. PRELIMINARY REQUIREMENTS

To initiate the planning process and clarify the confusion that exists about bikeway related issues, it is imperative that the D.P.W. disseminate planning guidelines and general information to all the towns in Massachusetts. The UMass Bikeways Study Group has prepared several documents which are suitable for this purpose. They are as follows:

1. Bikeways: Definitions

DISTRIBUTE BIKEWAYS INFORMATION

FIRST REGIONAL MEETING
MAY ONLY INVOLVE A PART OF
THE REGION OR A TOWN.



2. The D.P.W. Bikeways Planning Process

3. Bikeways: Funding

4. Bikeways: Design Standards

B. THE FIRST REGIONAL MEETING

As discussed previously, the R.P.A. must approach the D.P.W. for assistance via the established planning mechanism. Once the D.P.W. expresses a willingness to become involved, the R.P.A. organizes the first meeting which is primarily for informational purposes.

Although identified as the first regional meeting, the project or study area may only involve a part of the region or a town. For example, there may be a clearly identifiable area within the region which can justifiably be developed separately. In this case, the meeting would only involve people with an interest in this subregion and not the entire planning district.

Participants

Representatives from the Regional Planning Agency, the Department of Public Works, the Transportation Planning Advisory Group, Town Officials, and interested individuals and groups in the project area.

Purpose

1. To discuss the particular project concerned.
2. To discuss bikeways in general.
3. To discuss funding and the type of assistance available from the D.P.W.
4. To introduce the D.P.W. Bikeways Planning Process and the roles of the various groups involved, particularly the citizen advisory group involved in the process.

5. To recommend a tentative schedule for the meetings and workshops that are part of the planning process.

6. To outline the immediate steps necessary to insure continuity of the planning process.

BIKEWAYS ADVISORY GROUP (B.A.G.)

A SUB-COMMITTEE OF THE

TRANSPORTATION PLANNING ADVISORY GROUP (TPAG)

B.A.G.

LOCAL CONCERNS

TPAG

REGIONAL CONCERNS

COMPOSITION OF THE B.A.G.

BIKEWAYS ADVISORY GROUP

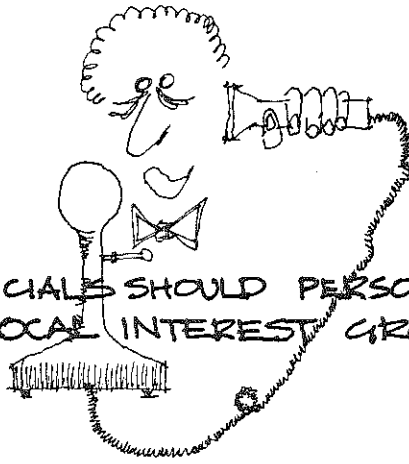
In an effort to assess the needs and desires of the community and maintain a source of citizen input throughout the planning process, a mechanism has been developed for consulting with local citizens. This is done through citizen advisory groups called Bikeway Advisory Groups (B.A.G.'s) which are subcommittees of the Transportation Planning Advisory Groups (T.P.A.G.s). The T.P.A.G.s are organized on a regional level and provide an opportunity for citizens to advise the Regional Planning Agency on transportation-related issues. For bikeways planning, advisory groups are organized at the town level and play an active part in the information gathering process. These Bikeway Advisory Groups (B.A.G.'s) therefore reflect local concerns, while T.P.A.G.s are concerned with broader regional issues.

The overall role of the B.A.G.'s in making planning recommendations and gauging public opinion will become apparent as the process is elaborated upon. However, the potential impact of bikeways on all aspects of transportation and recreation in the area underscores the importance of adequate citizen representation on the Bikeways Advisory Groups. In order to insure balanced consideration of community needs, representatives of the following groups will be included in the BAG's :

At least one town official, selectman, law enforcement officer, and T.P.A.G. member (if the town is represented on the T.P.A.G.).

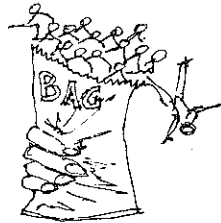
Every effort should also be made to involve members of other identifiable community groups, e.g., educators, merchant associations, park and recreation commissions, chambers of commerce, scouting groups, students, cycling and other recreational clubs, and other interested individuals, particularly those likely to be affected by the proposal.

TOWN OFFICIALS SHOULD PERSONALLY
CONTACT LOCAL INTEREST GROUPS



RESPONSIBILITIES FOLLOWING
THE FIRST MEETING

FORM B.A.G.



COMPLETE INVENTORIES

PRELIMINARY DEMAND ASSESSMENT
TECHNIQUES DEVELOPED

THE FIRST WORKSHOP

The B.A.G. is a working group which will support the town in developing a proposal and gathering data. Therefore, it is not only the responsibility of the town officials to encourage members of the community to work in the B.A.G.'s, but in their interests to do so. Every effort should be made to contact community leaders and groups, particularly those who may feel that bikeways are not their concern. While newspaper notices and regular town selectmen meetings may be an adequate forum for recruiting members to the B.A.G. in many cases, successful results will only be achieved by personally contacting representatives of the above-mentioned groups.

C. RESPONSIBILITIES FOLLOWING THE FIRST MEETING

The R.P.A. is responsible for distributing the minutes and any other relevant material to all other towns in the study area, whether they attended the meeting or not. It is also their responsibility to contact each town and assist with the formulation of the B.A.G.'s. After membership requirements for the B.A.G.'s have been satisfied, it is approved as a subcommittee by the T.P.A.G.

Before planning can begin, it is necessary to know if any bike-ways exist in the study area. Therefore, the inventory questionnaires prepared by the UMass team are to be completed by all the towns in the region and the results collated, summarized and mapped by the D.P.W.

Demand must also be assessed. This is the main subject of the first workshop. However, prior to the workshop, the UMass/D.P.W. publication entitled Demand Determination must be distributed to all the B.A.G.'s. The B.A.G.'s should then formulate preliminary procedures for applying the techniques described in this pamphlet to their town. If any problems are encountered, these should be summarized and submitted to the R.P.A. The R.P.A. then organizes the first workshop.

D. THE FIRST WORKSHOP

Depending on the scope of the project and the complexity of the problems experienced by the B.A.G.'s in interpreting the demand information, there may be one workshop for the entire study area or several smaller workshops.

THE FIRST WORKSHOP

DEMAND DETERMINATION

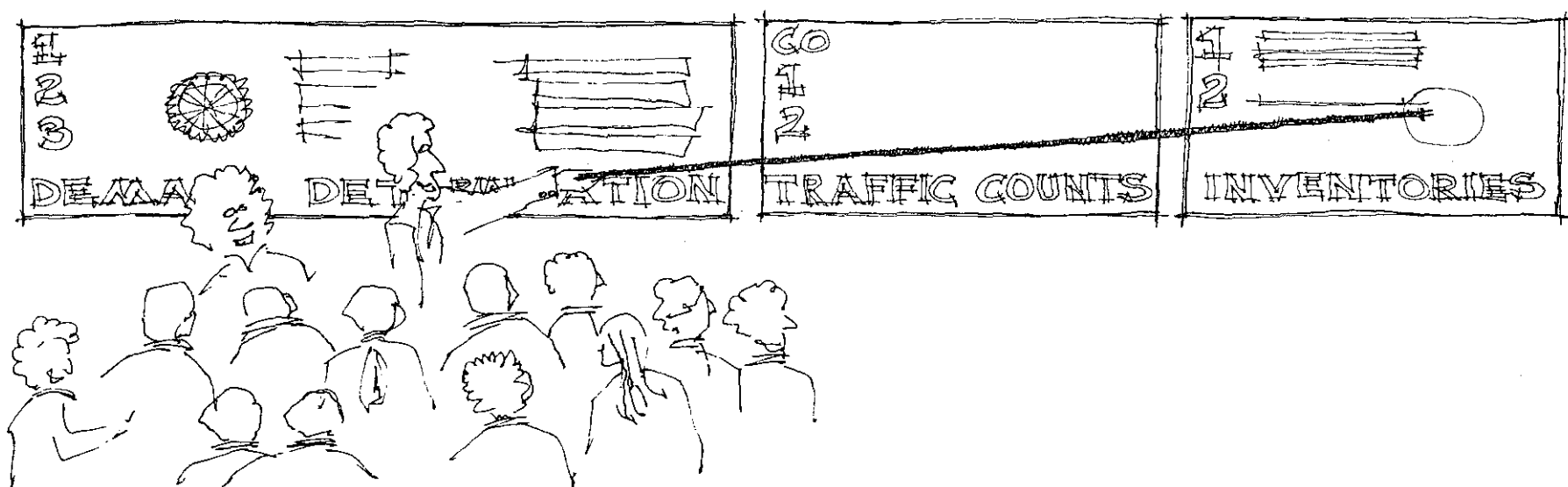
INVENTORIES

Participants

Representatives from the Regional Planning Agency, the Department of Public Works, the Transportation Planning Advisory Group and at least two members from each B.A.G. , one of whom should be a town official or selectperson.

Purpose

To discuss the first major phase of the planning process, namely demand determination and the inventories required of existing facilities and resources. Specifically, problems experienced by the various B.A.G.'s in developing techniques for applying the questionnaires will be discussed.



ROAD INVENTORY FORM

FORM COMPLETED BY _____ DATE _____

TOWN _____

ROAD NAME _____

LOCATION (OR SECTION) _____

TYPE _____

AVERAGE DAILY TRAFFIC (A.D.T.) _____

AUTOMOBILES _____

BICYCLES _____

WIDTH OF R.O.W. (AVERAGE) _____

WIDTH OF PAVEMENT _____

IS THE ROAD: ONE WAY ☐ TWO WAY ☐

No. OF TRAFFIC LANES EACH WAY _____

IS PARKING ALLOWED: ONE SIDE ☐
BOTH SIDES ☐

IS PARKING RESTRICTED DURING PEAK
HOUR TRAFFIC OR ANY OTHER TIME _____

SPEED LIMIT (M.P.H.) _____

PLANTING STRIPS: ONE SIDE ☐
TWO SIDES ☐

SIDEWALKS: ONE SIDE ☐
TWO SIDES ☐

ANSWER THE FOLLOWING STATING THE
AVERAGE NUMBER PER MILE

No. OF STOP SIGNS _____

No. OF TRAFFIC LIGHTS _____

No. OF INTERSECTIONS _____

PUT ADDITIONAL REMARKS ON BACK

E. RESPONSIBILITIES FOLLOWING THE FIRST WORKSHOP

The towns, assisted by the B.A.G.'s apply the demand questionnaires and collate the information in a suitable format for computer or manual analysis. Analysis format will be determined by the D.P.W.'s established procedure. For projects in which UMass is involved, computer analysis will be employed to analyze the information. Therefore, UMass or the D.P.W. will have to instruct the B.A.G.'s how to collate the information.

It is the towns' (and B.A.G.'s) responsibility to conduct the necessary bicycle traffic counts and provide bicycle accident data. Selected town roads must also be inventoried using the Road Inventory Form. (See figure 5.) These roads will be selected in the first workshop. Generally, roads that are likely to be used for bicycle facilities should be inventoried and have bicycle and traffic counts conducted on them (e.g., routes currently used by cyclists, routes paralleling state highways and major thoroughfares, and roads around schools and other facilities likely to attract cyclists). As automatic counting machines do not differentiate between different types of vehicles, it is not possible to count bicycles automatically when they share roadways with other vehicles. If, however, there are separated paths used exclusively for bicycle traffic in the study area, machine counting is possible. This was recently done in Oregon by the Oregon State Highway Division (MAUDEP, Proceedings of the Pedestrian/Bicycle Planning and Design Seminar, San Francisco, 1972, p. 210).

The towns must also provide the following information:

1. Zoning districts and regulations.
2. Existing transportation and parking systems.
3. Town plans.
4. Results of any relevant town questionnaires or reports. (e.g., Amherst Select Committee on Goals Report or preferential questionnaires).

FIGURE 5

INFORMATION SHOULD BE
PRESENTED GRAPHICALLY &
IN REPORT FORM

This information will provide a relatively comprehensive idea of what the existing conditions are, and what the future growth is likely to be. It should be presented as a summary in the form of a report, and also graphically. For example, the zoning districts in each town are mapped and the results of any questionnaires could be itemized and presented in a report and a chart. When this information is completed it should be submitted to the R.P.A.

✱ TOWN OFFICIALS ✱
✱ & B.A.G. MUST ✱
✱ MAINTAIN LIASON ✱
✱ WITH ENTIRE ✱
✱ COMMUNITY ✱

It is the responsibility of the B.A.G.'s and town officials to report back to their respective towns on all developments throughout the process. It is very important that this be done to maintain an adequate liason with the entire community to keep the B.A.G.'s from becoming an isolated, self-interested group, which does not represent a consensus of town opinion.

RPA PREPARES SUMMARY OF
INFORMATION USED TO DETERMINE
THE REGIONAL PRIORITY RANKINGS,
INFORMATION ON POSSIBLE IMPACTS,
& DETAILS OF TOWN & REGIONAL
TRANSPORTATION SYSTEMS

The Regional Planning Agency is responsible for providing a summary of the information used to determine the regional priority rankings, details of regional plans, (transportation and land use), and preliminary information on possible regional impacts of such a proposal. Details of regional and town transportation systems must also be provided. Bus routes both local, state and interstate must be mapped at a scale of 1:24000 (The scale of USGS topographic maps).

The information submitted by the towns to the R.P.A. should be put into a suitable format for public presentation. Bicycle Average Daily Traffic Counts (A.D.T's) and accident data should be mapped at 1:24000. Other information should be collated, mapped if possible, and presented in a summary report.

DPW IS RESPONSIBLE FOR
MAPPING LAND USE & RESOURCES,
EXISTING CORRIDORS, &
TRANSPORTATION SYSTEMS.

The D.P.W. is responsible for mapping land use and resources, existing corridors (e.g., railway and utility right-of-ways) in the study area, as well as supplementing transportation data provided by the R.P.A.'s. The majority of this information is available at a scale of 1:24000, which is an appropriate scale for this work. Although the land use maps (Massachusetts Map Down), prepared by MacConnell et al,

7.5 MINUTE USGS TOPOGRAPHIC MAPS (1:24000) ARE USED AS THE BASE MAPS

LAND USE MAPS (MASSACHUSETTS MAP DOWN) ARE THE PRIMARY SOURCE OF INFORMATION

DPW PREPARES 5 MAPS

1. LAND USE
2. HISTORIC, ARCHEOLOGICAL & UNIQUE SITES.
3. SCENIC VALUE
4. TRANSPORTATION
5. EXISTING CORRIDORS

are the primary source of this information, the classification system used is too detailed and much of the information stored on these maps obscures the features which are of interest in this study. Therefore 7.5 minute USGS Topographic Maps (1:24000) are to be used as the base maps. These are obtainable as mylar prints with as many or few features as required.

A total of 5 maps is required: a land use map; a map indicating historic, archeological and unique sites; a map indicating scenic value; one showing transportation; and one showing existing corridors such as abandoned railway and utility r.o.w.s.

1. Mapping Procedure: Land Use and Resources

Base Map: 7.5 minute USGS Topographic mylar without topographic details indicated.

METHOD:

(a) Residential: Two categories of residential are to be plotted; high density and low density. Using MacConnell's Land Use categories (refer to Appendix B) the high density classification includes UA, UT, and URH. Low density includes URM, URL, URO, URF, UE and UCR.

Graphic Key: High Density - URD
Low Density - URL

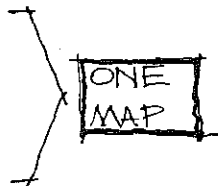
(b) Commercial Land:

Method: Two classifications for commercial facilities are plotted. Automobile-oriented commercial, UH and US (MacConnell classification) and Central Business District (primarily) UC (MacConnell classification).

Graphic Key: Automobile oriented - UCA
CBD - UC

MAP ONE: LAND USE & RESOURCES

RESIDENTIAL
COMMERCIAL
INDUSTRIAL
RECREATION
WETLANDS



SOURCE: MASSACHUSETTS MAP DOWN

(c) Industrial Land

Map as above using one classification keyed as UI and including "heavy industrial" (UI) and "light industrial" (UL).

(d) Recreation

Map as above using two classifications.

Recreation, i.e., RFB, RSB, RS, RC, RPG, RA, RAP, RFT, RP, RM, RG, RD (MacConnell classifications).

Automobile-oriented recreation, RSK, RT, RI (MacConnell classification)

Graphic Key: Recreation - R
Automobile-oriented recreation - RA

(e) Wetlands

Map as above using three classifications.

Open freshwater, i.e., W (MacConnell)

Marshes, bogs and saltwater wetlands, i.e., SS, M, SM, DM, B, BP, TSM, ISM and DSM (MacConnell)

Seasonally Flooded Land, i.e., SF (MacConnell)

Graphic Key: Open Freshwater - W
Marshes, etc. - WM
Seasonally Flooded - SF

(f) Open Public or Semi-Public Land Map as above using one classification (P) which includes UP, UO, and T (MacConnell).

MAP TWO: HISTORIC, ARCHEOLOGICAL & UNIQUE SITES

SOURCE: THE NATIONAL REGISTER OF HISTORIC PLACES, THE FEDERAL REGISTER & THE MASS. LANDSCAPE & NATURAL AREAS SURVEY

2. Mapping Procedure: Historic and Archeological Sites

(a) Map as above.

Source of information: The National Register of Historic Places and supplements published in the Federal Register.

The Regional Planning Agency should have a list of historic places and archeological sites, which may have been previously mapped. If the R.P.A. does not have a comprehensive inventory of these resources, it is their responsibility to contact

historic societies in the region and compile the information. Further sources for this information are given in the D.O.T. publication, Techniques for Incorporating Historic Preservation Objectives into the Highway Planning Process (Dec. 1972).

Graphic Key: Historic Buildings and Sites - H
Archeological Sites - A

(b) Unique Sites

Unique sites should be mapped in a similar way to that described above. This is an important step in assessing the environmental impact of a proposed project.

Source of Information: Massachusetts Landscape and Natural Areas Survey, Massachusetts Dept. of Natural Resources (1974), the Office of Conservation Services, D.N.R. and the District Environmental Engineer, D.P.W. District Offices.

MAP THREE : SCENIC QUALITY

THERE IS NOT A READY MADE
SOURCE WHICH ASSESSES
SCENIC QUALITY. THEREFORE
A METHOD IS DESCRIBED FOR
IDENTIFYING AREAS OF HIGH
SCENIC POTENTIAL

3. Mapping Procedure: Areas of High Scenic Quality

Map areas of high scenic quality in a similar way to that described above.

Source: Unfortunately there is no ready made resource atlas which can be consulted to provide a simple guide for mapping scenic quality. Unlike the very tangible uses and facilities previously mapped, scenic quality is difficult to assess, but it is a resource of undisputed value that must be considered if a sensitive and reasonable plan is to result.

It is difficult to assess the availability of an area from a user's (cyclist's) perspective without an intimate knowledge or detailed analysis of the study area. The discordant relationship between bicycle transportation and regional planning compounds this problem. However, the regional context plays a major role in determining scenic quality and it will therefore be analyzed to identify areas of high scenic potential. Unfortunately, this will not ensure that the scenic areas identified will be suitable for use by cyclists but rather that they are of interest on a local, state or national level.

B.A.G.'s RESPONSIBILITY TO IDENTIFY PLEASING & SCENIC AREAS

MAPPING TECHNIQUE IS USED IN
CONJUNCTION WITH FIELD
OBSERVATIONS.

BASED ON THE SCENIC ROADS
STUDY (DENIG, HOLDEN, 1975)

An examination of each subregion will be the responsibility of the B.A.G.'s, whose knowledge of the study area will enable identification of pleasing and scenic areas for cyclists.

The macro assessment technique described here is not a panacea for evaluating scenic quality but a tool for use in conjunction with controlled field observations and should be open to modification by input from citizen groups. The method is essentially a subjective assessment or comparison of clearly defined areas within a region. It is not necessary for these areas to be of a standard size or defined in the same way. All that is required is a convenient means of compartmentalizing the landscape into parcels which will enable a relative evaluation to be made.

The mapping technique is an adaptation of the macro assessment model of the Scenic Roads Study of the UMass/DPW Transportation Program (Denig, Holden, 1975). The number of landscape types within an area and hence the diversity, and the degree to which these landscapes differ (contrast) are the principal determinants. The basic hypothesis is that as diversity and contrast increase the scenic potential increases.

Using the analogues prepared by the Scenic Highway Study, the landscape types are delineated on 7.5 minute USGS topographic maps. The classifications are as follows:


Terrain Pattern Classification:


- (1) Steep hills
- (2) Rolling hills
- (3) Flat/undulating hills
- (4) Coastal zone

Land-Use Pattern Classification

- (A) Metropolitan
- (B) Regional City
- (C) Town-farm
- (D) Town-forest

1* THREE BASIC STEPS TO ASSIGNING SCORES TO LANDSCAPE TYPES

SCORE	TERRAIN JUXTAPOSITION	LAND USE JUXTAPOSITION
1	1/1  1/2	A/B C/D
2	2/3 3/4	A/C B/C
3	1/3 1/4 3/4	A/D B/D

 ALL OTHER IDENTICAL ITEMS EQUALS SCORE OF 1.

2*

TERRAIN JUXTAPOSITION SCORE + LAND USE JUXTAPOSITION SCORE = TOTAL "X" (LANDSCAPE TYPE)

"X" WILL BE WITHIN THE RANGE 1 → 6

3*

TOTAL SCORE AS DETERMINED IN 2. ABOVE	FINAL SCORE ASSIGNED TO LANDSCAPE TYPE
6	3
5	3
4	2
3	1
2	1

These categories are defined in Appendix C.

The matrix opposite is used to designate the landscape types which are composites of terrain and land-use patterns.

Once landscape types within the study area have been determined, it is simply a question of identifying areas with a high diversity. Contrast is evaluated by comparing the degree to which changes are apparent between the various landscape types.

Contrast between landscape types is obviously dependent upon the features of each type. A change from type D1 (town/forest-steep hills) to D2 (town forest-rolling hills) is minimal compared to a change from A3 (metropolitan-flat land) to a D1 landscape which involves changes in both land-use and terrain character. The matrices in figure 6 are provided as a guide to determining the contrast between adjacent land uses. The higher the cumulate score the higher the contrast.

In addition to diversity and contrast, special landscape features have a significant influence on the landscape. These are any natural or cultural resource considered to be of significance on a local, state or national level. For example, the presence of water will generally enhance scenic quality. In some locations special dominant features may immediately classify the entire region as being "scenic" (e.g., Holyoke Range). Special features are therefore evaluated on the basis of their individual merit and contribution to the resource value of a region and provide bonus scores for the particular area in which they occur.

To confirm the mapped resource value of an area field reconnaissance checks are used. They are to be preplanned and distributed in proportion to the mapped value of an area. The areas identified as having high scenic potential receive the most attention. Consideration should be given to the following:

(i) The significance of special features in the landscape, particularly small scale focal points not discernable on the USGS maps (e.g., interesting structures, plantings, rock outcrops).

FIGURE NO.

6

(ii) Obtrusive visual "misfits" which detract from scenic quality.

(iii) The character and quality of urban areas.

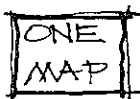
(iv) The area of view (scenic quality is increased as the area of view increases - Zube et al, 1974).

(v) The perceived change in elevation and amount of tree cover. (In general, scenic quality is increased as landscapes become more rugged and pronounced, and more natural or tree covered - Zube et al, 1974.)

MAP FOUR : TRANSPORTATION

RAIL

LIMITED ACCESS H'WAYS
& STATE NO. ROADS
SECONDARY ROADS
INTERCHANGES



SOURCE : USGS TOPOGRAPHIC MAP,
TOWN MAPS, & MASSACHUSETTS
MAP DOWN

4. Mapping Procedure: Transportation

(a) Rail

Source: 7.5 minute USGS topographic maps (1:24000), railroads operating in the area, and the RPA.

Method: Using the USGS map as the base map, verify that all the railway lines are still operational.

(b) Limited Access Highways and State-Numbered Roads

Source: 7.5 minute USGS Topographic maps (1:24000), the D.P.W., and R.P.A.

Method: Verify information on the USGS map and number all state roads.

(c) Secondary Roads

Source: 7.5 minute USGS Topographic maps (1:24000) and the respective town maps and town officials.

Method: Using the USGS map as a base map insure all major secondary roads are indicated.

(d) Interchanges

Source: Massachusetts Map Down (MacConnell et al)

Method: Locate all railway stations, airports, seaports and major bus terminals on a USGS Base map.

5. Mapping Procedure: Existing Corridors(a) Utility Rights-of-Way

Source: Massachusetts Map Down (MacConnell et al), the Massachusetts Public Utilities Commission, and the Utility companies.

Method: Map on a USGS base map all utility rights-of-way.

(b) Abandoned Railway Rights-of-Way

Source: Massachusetts Public Utilities Commission, USGS Topographic Map (1:24000), Railway Companies, and R.P.A.

Method: Plot all abandoned railway rights-of-way on a USGS base map.

(c) Canals, Rivers and Other Water Bodies

Refer to the DNR, Office of Conservation Services for information about the status of any easements for existing waterways. Indicate on the USGS base map the waterways that provide a particular opportunity or constraint to bikeways development.

Render dyeline prints of the USGS mylar base maps and photograph them using color transparency film. An overall photograph of each USGS map and a close-up of each town located on the map should be taken. These color transparency slides will be used to present the information to the B.A.G.'s at the next workshop.

MAP FIVE : EXISTING CORRIDORS

UTILITY RIGHTS OF WAY
ABANDONED RAILWAY RIGHTS OF WAY
CANALS , RIVERS & OTHER WATER
BODIES

SOURCE : MASSACHUSETTS MAP DOWN,
MASS. PUBLIC UTILITIES COMMISSION &
THE UTILITY COMPANIES.
R.P.A. & D.N.R.

PRESENTATION TECHNIQUES
FOR WORKSHOP TWO

THE RELATIVE SIGNIFICANCE TO CYCLISTS OF COMMUNITY FACILITIES & RESOURCES - USE OF THE QUESTIONNAIRES TO ASSIGN VALUES.

QUESTION: HOW OFTEN DO YOU USE YOUR BICYCLE TO GET TO THE FOLLOWING PLACES?

	RESPONSES			
	DAILY	T-WEEKLY	OCCASIONALLY	RARELY
TO SCHOOL	2000	1000	1500	2000
TO WORK	500	800	1000	1500
TO TOWN	400	400	4000	2000
TO LOCAL SHOPS	100	300	5000	2000
TO SHOPPING CENTERS	10	50	60	500
TO PARKS	50	500	6000	2000
ETC				

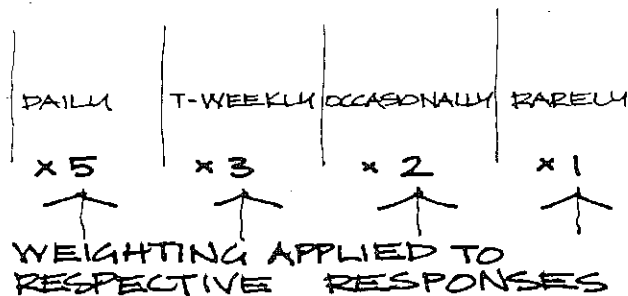


FIGURE No. 7

An essential part of the second workshop is to determine the relative significance to cyclists of community facilities and resources. Questions 9, 10, 11 and 12, of the household questionnaire and questions 8, 9, 10, and 11 of the schools' questionnaire require respondents to indicate how frequently they cycle to various facilities and resources in the community. (See Appendix D.)

These responses should be assigned values according to the frequency of use, and a total score determined for each land use or resource listed. The highest frequencies receive the highest value. To illustrate this, the following hypothetical case is used:

The total responses to the question "How often do you use your bicycle to get to the following places?" were as indicated in figure 7. A positive indication under "daily" is assigned a value of 5, "t-weekly" a value of 3, "occasionally" a value of 2, "rarely" a value of 1. These values are then totaled and graphed. (See figure 8.) The arithmetic means of the total scores for all the recreational and utilitarian users are then compared to determine what areas the proposed bicycle system should be designed to serve. The graph is a visual tool to aid in this analysis.

The means of the scores for each facility are then determined and a relative score or ranking is assigned. There are five categories. Facilities ranked in category 1 will be of a high significance, and hence have a high mean score and facilities in category 5 will be those of least significance to cyclists.

This ranking procedure, together with the results, should then be presented graphically and photographed on color transparencies. These color slides are to be used at the next workshop to explain how the ranking procedure was developed and what the proposed ranking system is. This procedure will help to obtain feedback from the workshop participants and establish a final ranking.

USING THE EXAMPLE IN FIGURE 7.
& APPLYING THE WEIGHTING FACTORS
THE TOTAL SCORES BECOME

SCORES				
	DAILY	T-WEEKLY	OCCASIONALLY	RARELY
TO SCHOOL	2000 x 5	1000 x 3	1500 x 2	2000 x 1
TO WORK	500 x 5	800 x 3	1000 x 2	1500 x 1
TO TOWN	400 x 5	400 x 3	4000 x 2	2000 x 1
TO LOCAL SHOPS	100 x 5	300 x 3	5000 x 2	2000 x 1
TO SHOPPING CENTERS	10 x 5	50 x 3	60 x 2	500 x 1
TO PARKS	50 x 5	500 x 3	6000 x 2	2000 x 1

TOTAL SCORES	
TO SCHOOL	18000
TO WORK	8400
TO TOWN	13200
TO LOCAL SHOPS	13400
TO SHOPPING CENTERS	820
TO PARKS	15750

GRAPH RESULTS

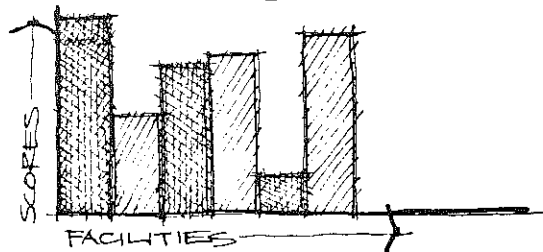


FIGURE NO. 8

The R.P.A. and the D.P.W. should then discuss the implications of the information gathered and mapped, and formulate preliminary goals and development scenarios to provide items for discussion at the second workshop. Presentation strategies for this workshop should also be determined.

The R.P.A. then organizes the second workshop.

F. THE SECOND WORKSHOP

Participants

Representatives from the R.P.A., the D.P.W., the T.P.A.G., and at least two representatives from each B.A.G., one of whom should be a town official or selectperson.

Purpose

1. To discuss the implications of the results of the demand questionnaire and other data gathered since the first workshop, and hence establish bikeway planning goals for the region or subregion.
2. To discuss specific opportunities and constraints to development, determine major connections and add local knowledge to the base information generated by the towns, R.P.A. and D.P.W.

This workshop is where the major decisions are made and therefore it is important that a suitable forum be established for interaction between the participants.

Techniques for encouraging participation in meetings and workshops are discussed in the chapter entitled "Application of the Model."

RESPONSIBILITIES FOLLOWING SECOND WORKSHOP

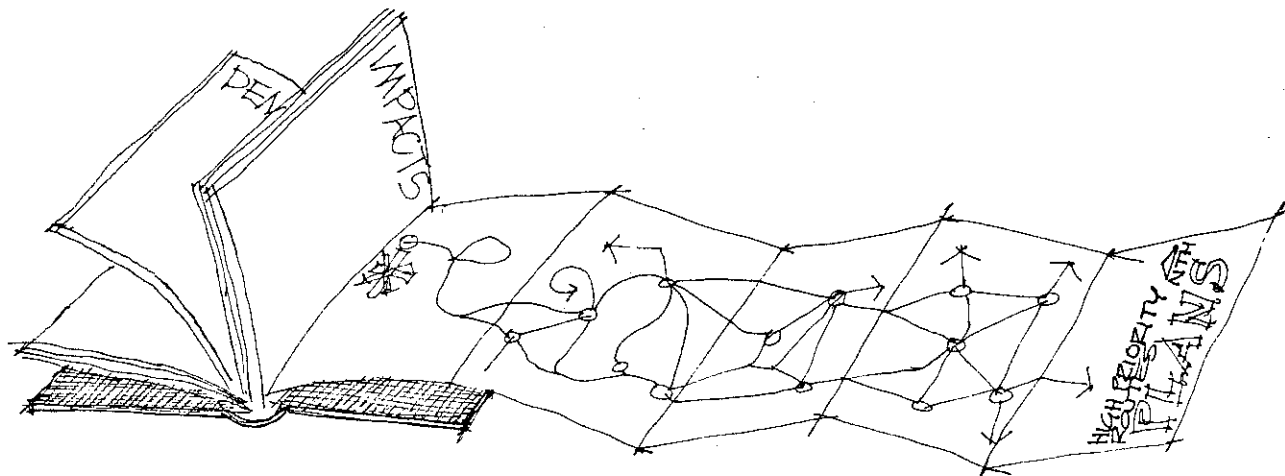
RPA WITH SUPPORT OF TOWNS & B.A.G. PREPARES "PRELIMINARY BIKEWAYS PLANNING REPORT" WHICH INCLUDES :

1. REGIONAL & TOWN PLANS
2. ADVANTAGES & DISADVANTAGES OF THE PROPOSAL TO THE COMMUNITY.
3. ENVIRONMENTAL IMPACTS
4. OPPORTUNITIES
5. DEMAND STUDIES
6. HIGH PRIORITY ROUTES

G. RESPONSIBILITIES FOLLOWING THE SECOND WORKSHOP

The R.P.A., with the support of the town officials and B.A.G.'s is responsible for documenting the process in a report entitled the Preliminary Bikeway Planning Report which should include summaries of the proceedings of all the meetings and workshops.

Copies of this report should be distributed to all the B.A.G.'s involved for approval and comment. It should then be submitted to the D.P.W. which will then determine the appropriate actions for Phase II of the Planning Process.



THE BIKEWAYS PLANNING PROCESS - PHASE II HAS TWO COMPONENTS

EXISTING DPW
PROCESS AS
OUTLINED IN
THE ACTION
PLAN

ROUTE SELECTION
PROCESS CALLED
THE SYNTHESIS
SUB MODEL

DPW PROCESS IS WELL
DOCUMENTED & WILL
THEREFORE NOT BE
DISCUSSED IN DETAIL

THIS COMPONENT WAS
DEVELOPED BY THE
UMASS BIKEWAYS STUDY
GROUP & WILL BE
DESCRIBED IN DETAIL

PROJECT DEVELOPMENT PHASE OF
THE MASS. ACTION PLAN REQUIRES
A PROGRESSIVELY MORE COMPLEX
PROCESS AS PROJECTS BECOME
MORE COMPLEX & LIKELY TO CAUSE
MAJOR ENVIRONMENTAL IMPACTS

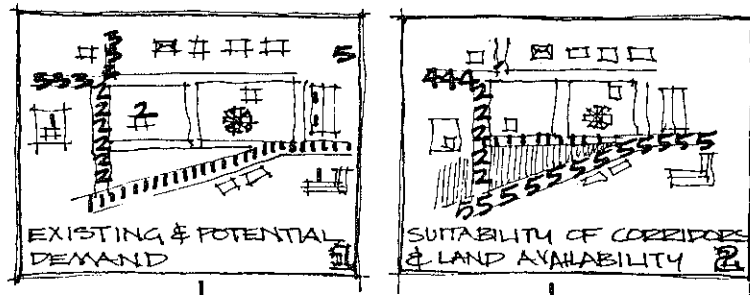
BIKEWAYS PLANNING PROCESS - PHASE II

This phase of the planning process involves two major components; the existing DPW planning process as outlined in the Action Plan, and a method for synthesizing the information previously gathered into alternative proposals and evaluating the routes previously identified in Phase I of the Planning Process.

The Phase II planning process parallels the Project Planning Phase of the Mass. Action Plan (1974) and is described in detail in that report. Therefore it will only be briefly discussed here. However, the synthesis submodel will be described in detail as it was developed by the UMass Bikeways Study Group specifically for Bikeways Planning.

The Project Development Phase of the Mass. Action Plan outlines the planning procedures required. These procedures are determined by a project's complexity and its likely adverse impacts. One of four alternative approaches will be followed, these are called Levels of Action. Level of Action I, as described in the Action Plan, is assigned to complex projects likely to have major impacts on the environment, such as large highways. Level of Action II and III are assigned to progressively simpler projects. Level of Action IV is assigned to projects such as minor road improvements, which require relatively simple planning procedures to adequately consider the possible alternatives and impacts.

SUMMARY OF SYNTHESIS SUBMODEL



SUPERIMPOSE
MAPS 1 & 2

EXISTING & POTENTIAL
DEMAND & LAND AVAILABILITY 2

CONTROL
PHASE I BIKEWAYS PLAN
DPW STATE BIKEWAYS PLAN

SYNTHESIS USING TIME/DISTANCE/
MODAL PROTRACTOR TO TEST
SCALE FACTOR

BIKEWAYS PLANNING PROCESS - PHASE II - SUMMARY OF THE SYNTHESIS SUBMODEL

Since the mid-sixties there has been growing nationwide opposition to highways and related projects which are viewed as being unresponsive to the needs and values of the community. The DPW has responded to this by encouraging citizen participation in their planning process and incorporating procedures into their work which enable the assessment of impacts at an early stage. However, although the basic planning framework has been established, a sequential model for route selection does not exist, particularly for bikeways.

The method proposed here is an attempt to remedy the deficiencies identified above. Essentially the model addresses the problem of where cyclists want to go and which routes are the most suitable and available for use as bikeways.

The methodology developed involves mapping and the use of overlay techniques. Each factor, whether a demand statistic, or a particular opportunity or constraint, is assigned a relative value and mapped to provide a graphic representation of the prevailing situation. Presenting the information graphically, not only provides a useful tool for analyzing and synthesizing the information but will, it is hoped, enable the general public to comprehend how the decisions were made.

A summary of the process involved is as follows:

1. Inventory and map existing bikeways.
2. Map the existing and potential demand for bikeways which have previously been determined. These are a reflection of user patterns and special values which must be considered in developing plans.

3. Map the high priority routes identified in Phase I of the planning process by the B.A.G.'s. This is another input into perceived demand. As these routes are based upon value judgments derived from the analysis of demand statistics, they are to be used as a checking mechanism against which the routes selected via the synthesis process will be compared. Therefore they are not used in the overlay process.
4. Similarly, the DPW State Bikeways Plan is mapped and provides another check of the solutions derived through this process.
5. Map the relative suitability of existing corridors and the availability of land for bikeways.
6. The maps produced in 1, 2 and 4 are superimposed to produce a composite of existing and potential demand, with the relative suitabilities of existing corridors and the availability of land indicated. The maps produced in steps 3 and 4 are used to check the results.
7. Identify several alternative suitable routes which respond to the existing and potential demand. Use the time/distance/modal protractor (developed by UMass, see page 36) to check the distance factor).
8. Map the significant cultural and natural factors which may influence the selection of the routes identified above. These include sites requiring protection (e.g., historic and archaeological sites) and natural limiting factors (e.g., slope and surface drainage).
9. Transpose the factors mapped in 8, above and the alternative routes selected in 7, and document all points of conflict. This will form the basis of the impact report and will enable the selection of a reasonable alternative that meets the demand criteria and responds to economic, social and environmental factors.

10. Use field reconnaissance checks to insure that selected alternatives meet minimum standards of environmental quality and do not present unexpected safety hazards or construction problems.

Figure 9 summarizes the synthesis phase.

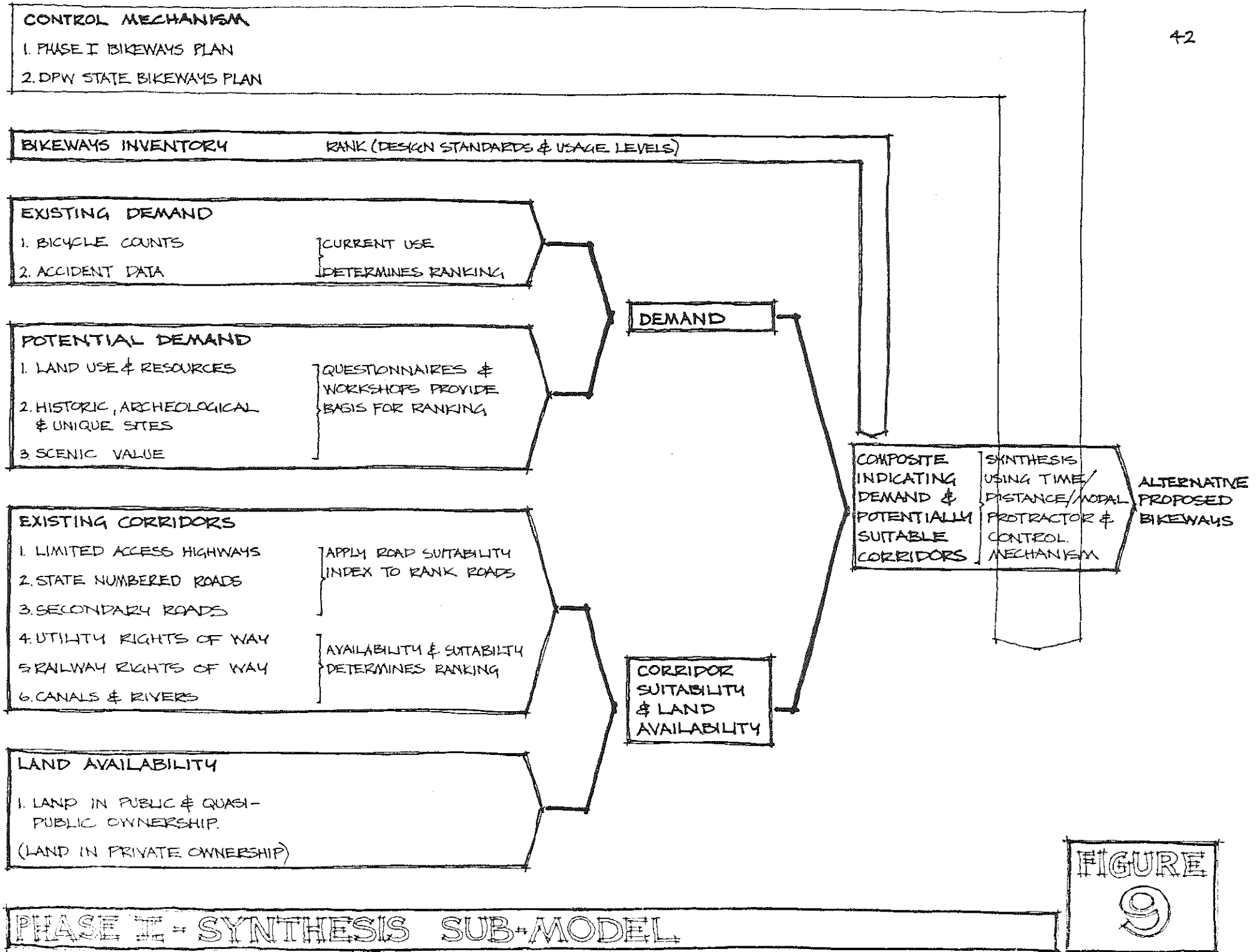


FIGURE 9

DESCRIPTION OF EACH STEP IN THE SYNTHESIS SUBMODEL

SYNTHESIS SUBMODEL - PROCEDURES AND TECHNIQUES

The procedures involved in the synthesis submodel will be described in detail in the sequence in which they are applied. Therefore, this is an elaboration of the summary presented in the previous section.

BIKEWAYS INVENTORY

A. INVENTORY EXISTING BIKEWAYS

The existing bikeways were inventoried and mapped in Phase I of the planning process. In addition, safety, construction and maintenance problems should be identified and appropriate remedial action recommended.

B. DEMAND

Existing and potential demand indicates where bikeways are most needed.

Base Map

7.5 minute USGS topographic map (1:24000) with topographic features deleted.

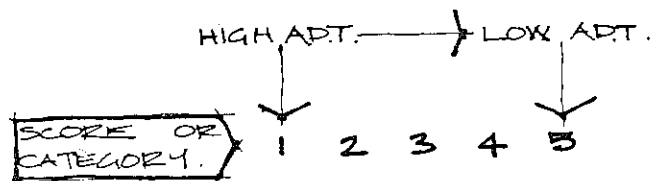
1. Existing demand or usage is determined for each route for which data is available. It can be determined from bicycle counts on existing rights-of-way and accident data. Although numbers of accidents primarily indicate points of conflict and unsafe routes, they can be correlated with use levels. In addition, high accident levels clearly indicate a need for improved facilities.

For each road the procedure is as follows: Average Daily Traffic figures (ADT's) for bicycles are compared and a relative score determined by ranking them into 5 categories. A high ADT is assigned to category 1 and a low ADT is assigned to category 5. Accident statistics are similarly divided into five categories.

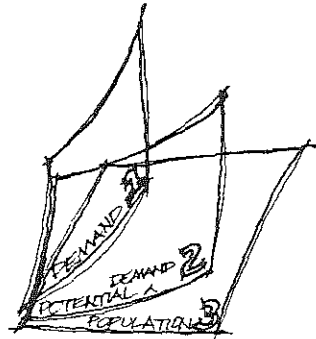
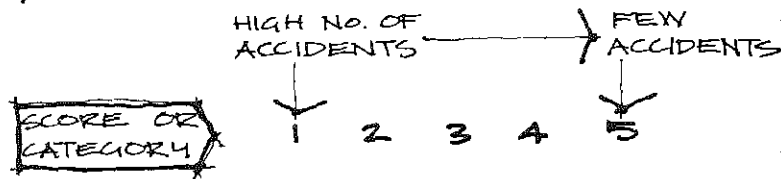
DEMAND:

1. BICYCLE TRAFFIC COUNTS
2. ACCIDENT STATISTICS
3. COMMUNITY FACILITIES & RESOURCES
WHICH GENERATE BICYCLE
TRAFFIC & ATTRACT CYCLISTS.
4. POPULATION & AGE
DISTRIBUTION

BICYCLE TRAFFIC COUNTS



ACCIDENT STATISTICS



COMPOSITE OF MAPS 1, 2 & 3
BY SUPERIMPOSING TRANSPARENCIES

The arithmetic mean of these two assigned values is then calculated to determine the relative ranking or score for the road.

The total score for each road is then plotted as a linear legend.

2. Potential demand involves the identification of community facilities and resources that generate bicycle traffic (generators) and attract cyclists (magnets) (e.g., schools, shops, transportation interchanges). Nodes that need to be connected are identified and ranked, according to their significance in five categories as described on page 35 of this report.

The score for each is indicated as a point legend on a base map.

3. Although population density is not a finite indicator of demand, it can be used as a means of assessing the significance of the above statistical data. It may be used as a modifier by indicating trends and user patterns.

Census data is used to provide population and age distributions information which is mapped to locate areas of probable high use. Generally, bicycle usage is highest among children and adults up to 25 years old. There are indications that correlations may also exist between bicycle ownership and income levels but reliable statistical data is as yet unavailable.

4. A composite map of 1, 2 and 3 is then produced by superimposing transparencies of the individual maps. This map indicates the overall demand for bikeways in relation to population density and population age distributions.

C. HIGH PRIORITY ROUTES IDENTIFIED IN PHASE I OF THE PLANNING PROCESS

Map the high priority routes identified in Phase I of the planning process by the B.A.G.'s. This map provides a checking mechanism against which the alternative routes generated by the synthesis submodel can be judged.

D. DPW STATE BIKEWAYS PLAN

Map the routes proposed by the RPA's and DPW in the State Bikeways Plan.

E. SUITABILITY OF EXISTING CORRIDORS AND AVAILABILITY OF LAND FOR BIKEWAYS

1. Roads

The suitability of roads for bikeways is a product of the physical characteristics of the right-of-way, the potential hazards, and the volume and speed of traffic using the road.

To enable existing roads to be compared, a Road Suitability Index has been devised. This index is calculated for roads having high bicycle ADT's as well as other roads potentially suitable for bikeways.

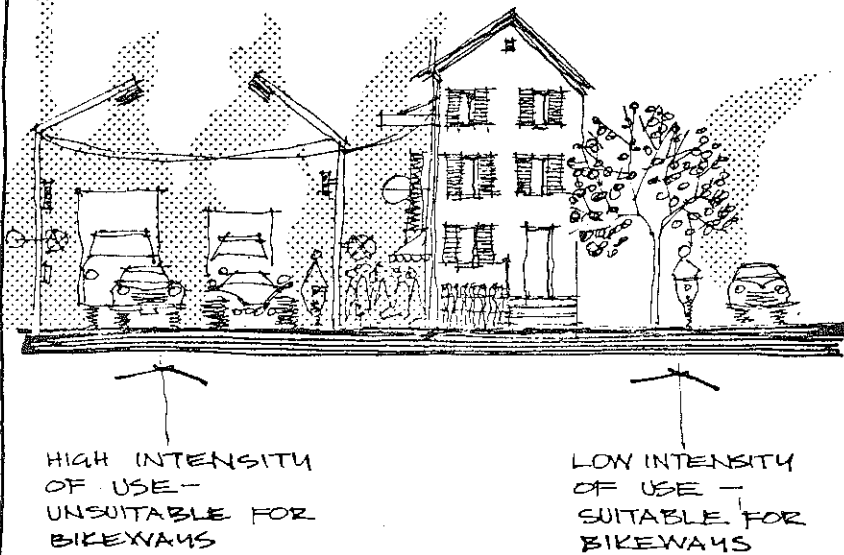
Town roads and state highways were previously inventoried and this information is used in the following formula.

Road Suitability Index =

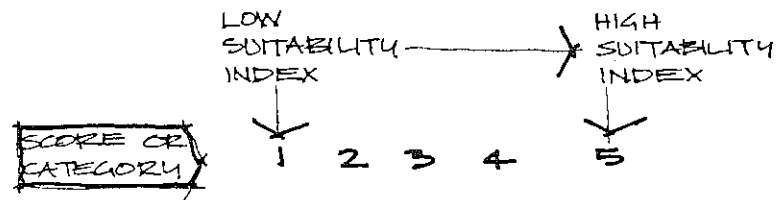
$$\frac{\text{Average Hourly Traffic (auto)}}{\text{no. of lanes in each direction}} \times \frac{\text{Pavement width}}{\text{width of r.o.w.} + \text{(including parking lanes)}}$$

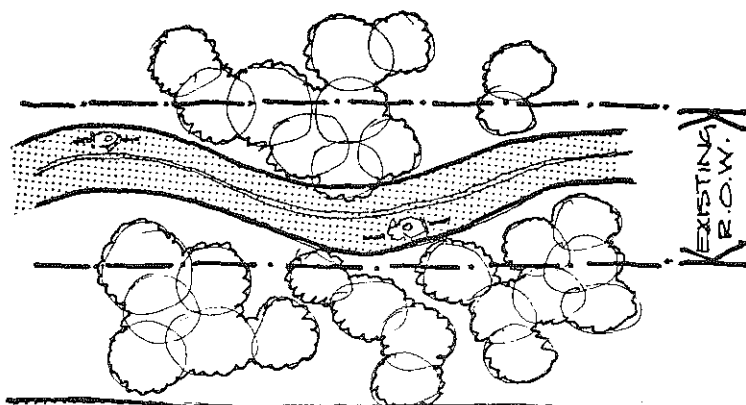
$$1/2 (\text{speed limit in miles/hour}) + (2 \times \text{no. of intersections/mile})$$

Roads are classified into five categories on the basis of their suitability index and mapped as line legends. The higher the suitability index, the less suitable the road for bicycle facilities. Therefore, high values will be assigned to category five and low values to category one.



CALCULATE ROAD SUITABILITY INDEX
& RANK IN FIVE RELATIVE
CATEGORIES





ABANDONED R.W. R.O.W. & UTILITY
R.O.W. PROVIDE OPPORTUNITIES
FOR BIKEWAYS DEVELOPMENT
& MAY ALLOW FOR ADEQUATE
SEPARATION OF BIKEWAYS
FROM ROADS

2. Utility and Railway Rights of Way

Bikepaths provide advantages over other types of facilities as they make possible sufficient separation of bicyclists from roadways. This has obvious safety advantages and mitigates health hazards to cyclists caused when automobiles and bicycles share the same right of way.

Although the advantages of bikepaths can be easily appreciated, the problems of siting such facilities and acquiring land often make them economically unfeasible.

Existing and available utility and railway rights of way provide ready made corridors which are free from land acquisition problems. Therefore, they provide distinct opportunities for bike-path development, particularly if they are located in areas of high demand.

These corridors have previously been mapped and are to be ranked as highly suitable for development.

3. Canals and Rivers

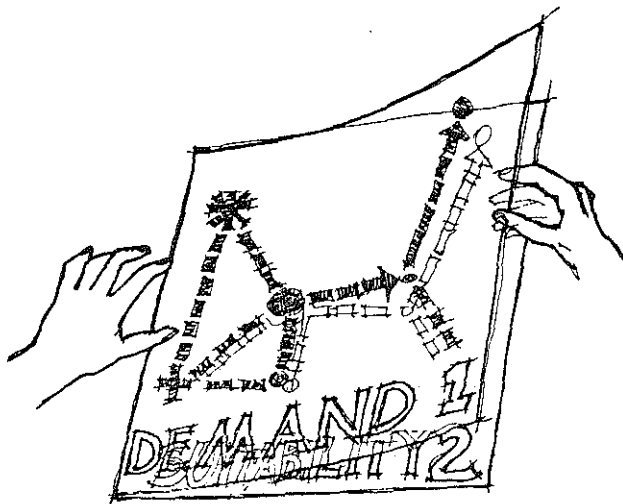
Canals and rivers are often in the public domain and, as such, may be available for projects such as bikeways. They may be developed as part of a recreation system, waterfront renewal, or rejuvenation project. (Wing, 1975)

It is difficult to calculate the suitability of rivers and canals using a simple formula since too many variables are involved. Therefore, each situation must be evaluated and mapped on its individual merits.

4. Map land in public and quasi-public ownership (e.g., parks, schools, etc. which were previously mapped in Phase I as R, P, H, and A). The remainder of the land is assumed to be in private ownership and therefore provides a limitation to development.

5. A composite map of 1, 2, 3, and 4 is then produced by superimposing transparencies of the individual maps. This map

SYNTHESIS



SUPERIMPOSE MAP INDICATING
SUITABILITY OF CORRIDORS &
AVAILABILITY OF LAND, WITH
THE MAP INDICATING DEMAND

TIME/DISTANCE/MODAL PROTRACTOR

indicates the suitability of existing rights of way for bikeways development and the availability of land.

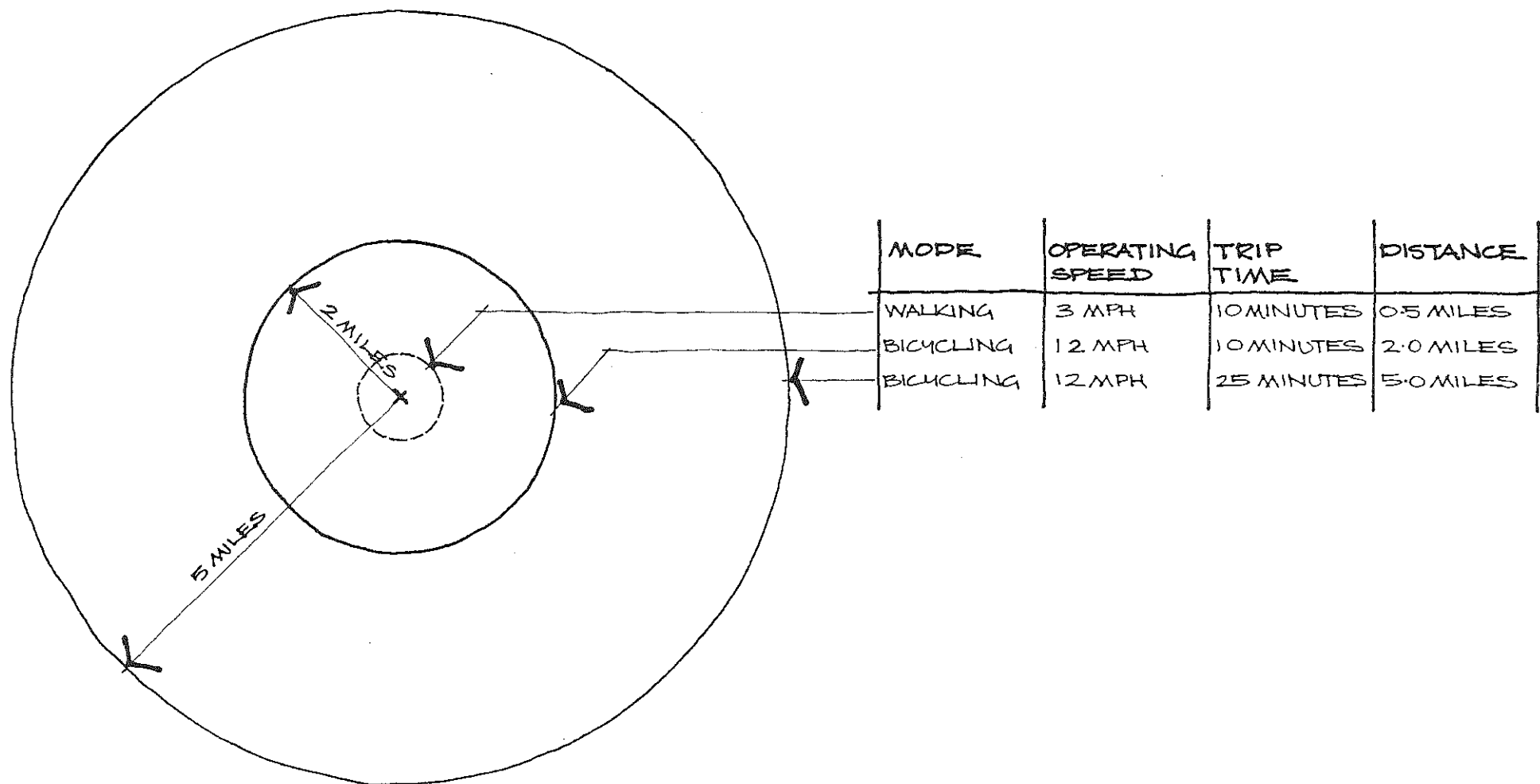
F. SYNTHESIS

The composite map produced indicating demand (Step B.4), the composite map indicating the suitability of corridors and the availability of land (Step C.5) are superimposed. The resulting map indicates existing and potential demand for bikeways, the facilities that need to be linked, and potential and existing corridors.

The composite overlays provide a visual tool for analyzing the information by indicating the suitability of corridors that correspond to or parallel routes with high usage levels.

Distance is a significant factor in bicycle transportation planning due to the speed of bicycles and physical effort involved in cycling. As the cycling distance to destination points increase, these nodes become less attractive to cyclists and generate fewer trips. A direct correlation such as this suggest the possibility of using mathematical modelling to predict bicycle journeys. Methods such as the simple gravity flow model or computer modelling and assimilation could be adapted for use in bikeway planning (Everett, 1974). However, there are modelling problems due to the difficulty in determining the distribution of cyclists, the unpredictable nature of recreational traffic and the influence of topography, traffic and roadway conditions on bicycle usage.

Furthermore, it is difficult to explain the mathematical manipulations required in these modelling procedures to the citizen advisory groups involved in the planning process. To ensure the effectiveness of these advisory groups, it is imperative that all decision-making procedures and planning techniques are readily comprehensible. Therefore, a more direct empirical method is used to interpret the data. A time/Distance/Modal Protractor has been developed for this purpose. The Protractor (Figure 10) is used in conjunction with the composite map, produced in step 4 above, to determine feasible internodal connections.



NOTE: THE MAJORITY OF CYCLISTS WILL TRAVEL TWO MILES BUT ONLY 15% OF THE CYCLING POPULATION WILL TRAVEL DISTANCES GREATER THAN 5 MILES (ONE WAY).

FIGURE
10

TIME/DISTANCE/MODAL PROTRACTOR • SCALE: 1" REP. 2.0 MILES

TIME/DISTANCE/MODAL PROTRACTOR

The inner circle on the protractor (indicated by a broken line) represents a distance of 0.5 miles from the center, which is a ten minute trip for a pedestrian (assuming a walking speed of 3 mph). The other concentric circles (represented by solid lines) indicate bicycle journeys of various lengths assuming an average speed of 12 mph. The inner circle represents a two mile (ten minute) journey from the center outwards in any direction. It is reasonable to expect that the majority of cyclists will travel this distance (Barton-Aschman Associates, 1973). The outer circle represents a journey of five miles, a significant distance since only 15% of the cycling population will travel farther than five miles per journey (Vermont Bicycle Study, 1974).

The Phase I Plan is developed by community groups who are personally involved in the problems of their town on a day to day basis. Therefore, their appraisal of the situation, although subjective to a degree and based upon limited information, provides a valuable input into the process. To ensure its continuing influence in the decision making process, the Phase I Plan is retained, along with the DPW State Bikeways Plan, to provide the necessary control mechanism. In this way, emerging bikeways plans will be influenced and ammended as necessary to include the high priority routes identified in Phase I. If, however, there are major conflicts along the routes selected in Phase I, more appropriate alternatives may have to be chosen.

LIMITING FACTORS

G. LIMITING FACTORS

To better determine the suitability of the routes, the following factors should be considered.

1. The environmental quality on the corridor utilized.
2. Potential impacts to culturally significant and ecologically sensitive areas.
3. The physical constraints to development.

4. The relative costs of each proposal as a function of length and construction requirements.

An evaluation of these variables may reveal severe limitations which may influence the selection of proposed routes. For example, steep slope (15-25% and 25%+) will require extensive grading to provide a bikeway that can be easily negotiated by most cyclists. Hence, increased costs are involved and inevitably much disturbance to the existing landscape results. Similarly, a bikeway constructed on soils of low bearing capacity incur increased costs resulting from the necessary improvements to the subbase material. Other limitations may result in areas ecologically so sensitive that even the relatively minor disturbance caused by bikepath construction and subsequent increased use would be disruptive.

SUITABILITY INDICES

Suitability indices have been developed for a range of factors to assist bikeway planners in making decisions. These will enable the possible consequences of decisions made to become apparent early in the planning process, thereby allowing trade-offs to be made more easily prior to the commitment of additional funds and expertise. The suitability indices will also ensure more accurate cost estimates. Each of the factors selected is ranked according to its suitability for bikeway development and mapped. Transparencies of the resulting maps are then superimposed one at a time over the proposed routes and points of conflict documented.

In addition, a composite suitability diagram is generated by overlaying the suitability maps. Each factor is rated from most suitable (graphically represented as a light tone) to least suitable (graphically represented as a dark tone). Therefore, when these maps are overlaid, the areas with the lightest tone represent those areas most suitable for development, while areas with the darkest tone represent areas least suitable for bikeways. This composite suitability map provides an overview of the prevailing conditions, while the individual maps define the specific problems.

The construction related constraints of soil, drainage and depth to bedrock are not as significant when proposed facilities will utilize existing paved surfaces.

LIMITING FACTORS

UNIQUE, HISTORIC & ARCHEOLOGICAL SITES

VERY FEW SITES WOULD BE EXCLUDED FROM USE BY CYCLISTS BUT NEVERTHELESS, EACH SITE MUST BE ASSESSED ON THE BASIS OF ITS INDIVIDUAL CHARACTERISTICS

SLOPE

Figure 10 summarizes the application of the limiting factors to several alternative proposals.

1. Unique, Historic and Archeological Sites

These resources are a part of a community's cultural heritage and, as such, they are irreplaceable. They have previously been mapped and considered for the opportunities they afford. However, due to their fragility and value, they must also be protected from any potentially harmful development.

In general, very few sites would be excluded from use by cyclists but nevertheless, each site must be assessed on the basis of its individual characteristics. Even when it is decided to utilize a particular site, proposed schemes must reflect a sympathetic understanding of its unique qualities.

A composite transparent map is produced of these resources which is superimposed on a map of the proposed routes. Where conflicts occur, they are recorded and each site concerned is considered individually as to its suitability for bikeways development.

2. Slope

Slope must be considered from two points of view: as a limitation to the construction of a bikeway and as a limitation to use of the facilities by bicyclists.

Although bicycle paths and associated facilities, such as rest stops, are small in scale and hence cause little disturbance in the landscape, the physical limitations to development are similar to those for building and road construction. As slope increases, the costs of development increase. This can be alleviated somewhat by building along the contours instead of traversing them. However, even when sensitive grading plans are developed, construction costs increase as slope increases due to the need for additional grading, cut and fill operations, and retaining walls. These costs generally become prohibitive in slopes over 25%.

LIMITING FACTORS

CONSIDER EACH FACTOR INDIVIDUALLY &
DOCUMENT POINTS OF CONFLICT

UNIQUE,
HISTORIC &
ARCHEOLOGICAL
SITES

SLOPE

SURFACE
DRAINAGE

DEPTH TO
BEDROCK

SOILS

PROPOSAL ONE

PROPOSAL TWO

PROPOSAL THREE

PROPOSAL FOUR

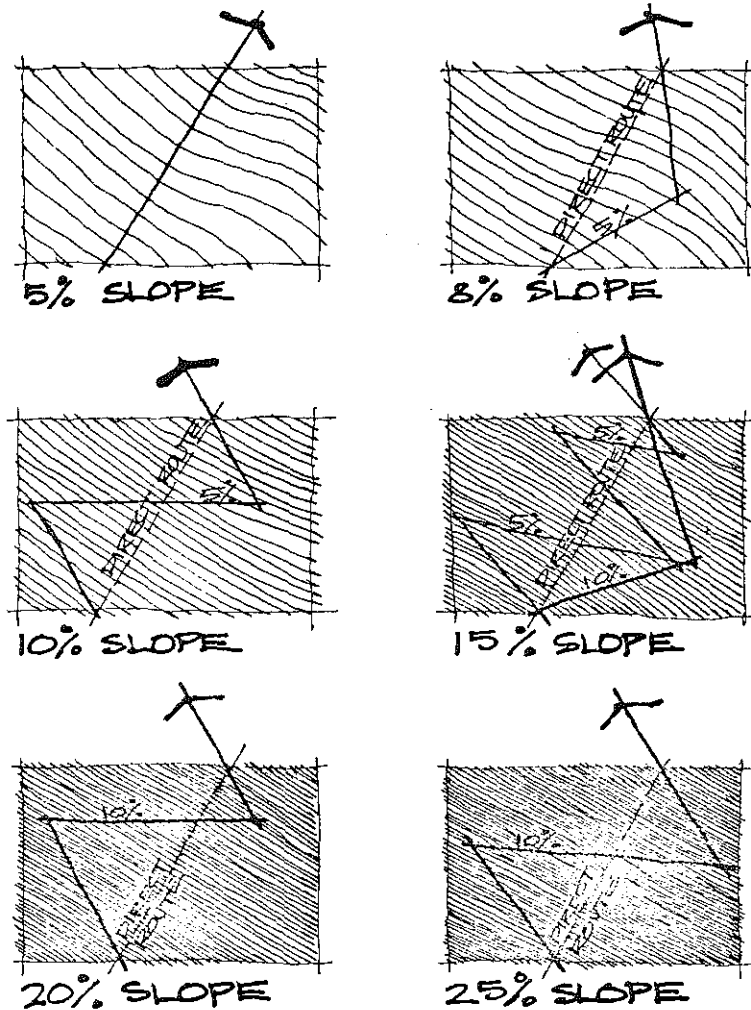
SUMMARY OF
IMPLICATIONS
OF EACH
LIMITING FACTOR
TO EACH
PROPOSAL.

COMPOSITE
OF
LIMITING
FACTORS

PROPOSAL
RECOMMENDED
FOR IMPLEMENT-
ATION.

FIGURE
11

PHASE II SYNTHESIS SUB-MODEL



THIS FIGURE ILLUSTRATES THE ROUTE THAT A BIKEWAY WOULD HAVE TO TAKE IN VARIOUS SLOPES TO MAINTAIN A UNIFORM GRADE OF 5% OR 10%. IN THE 5%, 8% & 10% SLOPES A BIKEWAY OF 5% GRADE IS INDICATED. IN THE 15% SLOPE BIKEWAYS OF 5% & 10% GRADES ARE INDICATED. IN THE 20% & 25% SLOPES A BIKEWAY OF 10% GRADE IS INDICATED.

FIGURE NO.

12

Long grades of 5% are difficult for most cyclists to negotiate. If steeper grades are unavoidable, 10% should be considered an absolute maximum but these should only be sustained for short lengths (Cooke, 1960's).

In planning terms, this does not mean that slopes over 10% should be considered a severe constraint as it is often possible, as intimated previously, to build along the contours. By analyzing various slopes and using 5% and 10% as critical values, a suitability index was developed which is based primarily on grade. See figure 12 which indicates some examples of the additional length of bikeway needed in various slopes to maintain a grade of 5% and 10%. The classification system is as follows:

- (1) Suitable: 0 - 8% slopes
- (2) Slight limitation: 8 - 15% slopes
- (3) Moderate limitation: 15 - 25% slopes
- (4) Severe limitation: 25%+

Using a USGS topographic map (1:24,000), a slopes analysis is prepared for the study area in accordance with the above classification system. This map and a map of the proposed bikeway system are superimposed and the relative suitability of each alternative is documented. It should be noted that if the bikeway is to use an existing road or other graded right of way (e.g., railway), the grades may be considerably different from those indicated on the USGS map.

3. Surface Drainage

Natural surface drainage is adversely affected by the construction of buildings and roads, which increase the rainwater runoff and interrupt natural drainage channels. In addition, the more complex or dense the natural drainage network, the greater the cost of construction due to the additional bridges, culverts, storm drains and drainage channels required.

Therefore, a suitability index has been developed to take into account the complexity of the natural drainage systems.

SLOPES

54

(1) Most Suitable

Absence of surface water or pronounced drainage channels. These represent the least obstruction to development.

(2) Suitable

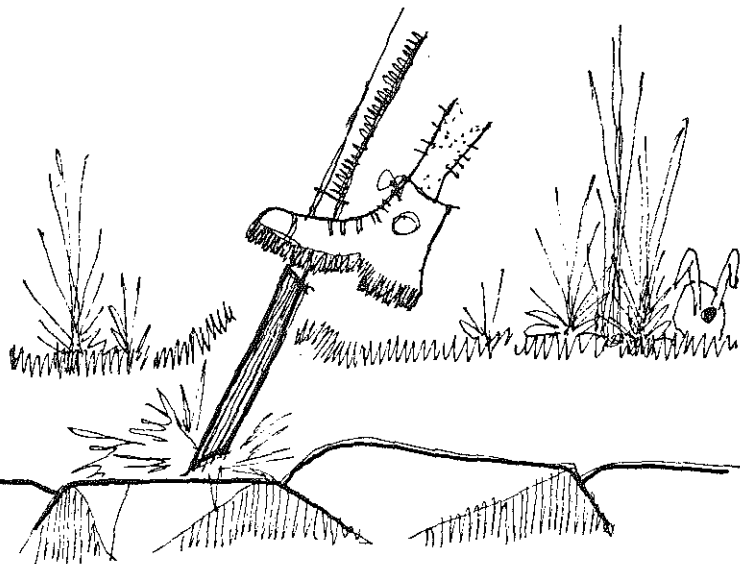
Natural drainage channels and areas of constricted drainage. These represent areas of moderate limitation to development.

(3) Least Suitable

Surface water features such as lakes, streams and ponds. These represent a major obstruction to development.

These should be ranked in accordance with the above classification system and mapped. By superimposing this suitability map and a map of the proposed bikeway network conflicts and problem areas may be located and documented.

DEPTH TO BED ROCK



BEDROCK CAN CAUSE OBSTRUCTIONS
TO DEVELOPMENT

4. Depth to Bedrock

As no major construction is involved in building bikeways, precise geologic information is not required. However, the presence of bedrock near ground level may cause subsurface drainage problems. In addition, if construction involves the excavation of bedrock, increased costs will be incurred. A suitability index has been developed which considers these factors.

(1) Most Suitable

Bedrock below five feet which is unlikely to cause any obstruction to development.

(2) Suitable

Bedrock within five feet of the ground surface which could cause problems when extensive grading is involved.

(3) Least Suitable

Bedrock near the ground surface (18" and above), an indication of

which are rock outcroppings. These present the greatest limitation to development.

These are mapped and the suitability of the alternative bikeways assessed in a similar way to that previously described.

SOILS

5. Soils

New pavement surfaces built specifically for bicycles must be capable of supporting the wheel loads of bicycles and riders, as well as the loads of maintenance vehicles or other types of motor vehicles which may use or cross the facility. In Massachusetts, bikeways are constructed using a similar standard to that of sidewalks. This is probably adequate if the subgrade is a stable, well drained soil. The major problem in this state is that of frost heave, a problem compounded by poorly drained subgrade material. Therefore, to prevent premature breakup of the pavement due to frost heave when unsuitable soils are encountered, it is necessary to excavate the poor material and replace it with a more suitable, well drained and stable material. Additional costs are incurred as a result.

A suitability index has been developed rating soils according to their suitability as a subgrade material. In the suitability index, a description is given of each soil followed by its Unified Classification Symbol in parenthesis. At the end of each category, the approximate corresponding A.A.S.H.O. classification is given.

(1) Suitable soils for use as a subgrade material.

- Well graded gravels or gravel-sand mixtures, little or no fines (GW).
- Poorly graded gravels or gravel-sand mixtures, little or no fines (GP).
- Silty gravels, gravel-sand-silt mixtures (GM).
- Clayey gravels, gravel-sand-clay mixtures (GC).
- Well-graded sands or gravelly sands, little or no fines (SW).
- Poorly graded sands or gravelly sands, little or no fines (SP).
- Silty sands, sand-silt mixtures (SM).

(2) Soils with moderate limitation for use as a subgrade material.

- Clayey sands, sand clay mixtures (SC).
- Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity (ML).
- Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays (CL).

Corresponding A.A.S.H.O. classifications are A-4, A-5 and A-6.

(3) Soils with severe limitation for use as a subgrade material.

- Organic silts and organic silt-clays of low plasticity (OL).
- Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts (MH).
- Inorganic clays of high plasticity, fat clays (i.e., fine, colloidal clay) (CH).

Corresponding A.A.S.H.O. classifications are A-6 and A-7.

(4) Unsuitable soils for use as a subgrade material.

- Peat, muck and other highly organic soils (PT).

The U.S.D.A., S.C.S. has identified and mapped soils over half of the United States. These soil maps provide a valuable source of information to planners. Two types of soils maps have been produced: a general soils map and a detailed soils survey. The general soils maps produced are developed using gross sampling techniques and accumulate several soil types into soil associations. These maps are not very accurate and are not intended for use in detailed planning studies. However, a detailed soils survey is relatively accurate and provides a useful data source for planning work. Unfortunately, these surveys have not been conducted for all parts of the state. However, in areas where soil surveys have been conducted these will be used as the main source of information, supplemented by the DPW soils surveys conducted for specific projects.

The U.S.D.A., S.C.S. soil series and soil textures can be assigned to one of the four suitability categories above by

ASSESS ENVIRONMENTAL QUALITY OF POTENTIAL CORRIDORS

referring to the "Technical Guide Material, Engineering Interpretations, Table 3. Estimated Physical and Chemical Properties of Soils" (U.S.D.A., S.C.S.), which gives corresponding U.S.D.A. soil textures a corresponding unified classification.

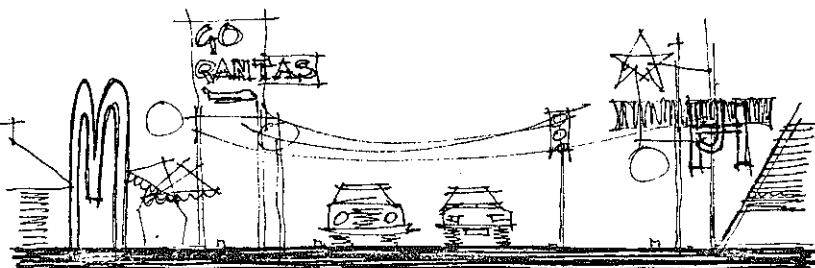
H. FIELD CHECKS

By using the process described in the previous sections, a few alternativesolutions will probably emerge as being the most suitable for bikeways. Field checks should then be used to further assess the advantages and disadvantages of these routes. Specific problems, safety hazards and obstructions likely to cause construction difficulties should be identified. Scenic quality, or more importantly, the environmental quality of each route, should also be evaluated during this final stage of the selection process.

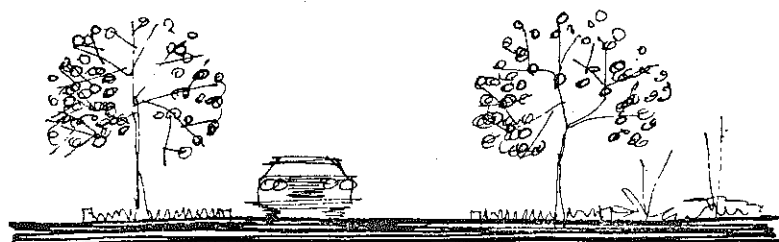
The field checks should be documented and the significant features of each route (advantages or disadvantages) should be photographed for presentation to the communities involved.

I. TYPE OF BICYCLE FACILITIES

Although some of the procedures employed in the planning process are simply gross assessment techniques for eliminating totally unsuitable routes, they do reflect the needs of all types of bikeways. Throughout the process all the potential routes considered are evaluated for their suitability to accommodate specific types of bikeways. The decision to provide a particular type of facility may be a result of potential use, the costs involved, or of the community's goals. This decision will be made when the alternative proposals are compared. It will be another determining factor in the selection of a bikeways plan. A method for selecting appropriate bicycle facilities along existing roads is discussed in the publication Design Standards which was produced as part of this contract. This selection procedure is based upon the volume of automobile traffic. (See Appendix E.)



1 PREVIOUSLY RANKED SUITABLE BECAUSE
OF NO. OF INTERSECTIONS, WIDTH OF ROW,
& LOW SPEED LIMIT.



2 PREVIOUSLY RANKED SUITABLE BECAUSE
OF NO. OF INTERSECTIONS, LOW SPEED
LIMIT, & LOW INTENSITY OF USE.

A discussion of the relative merits of the types of bikeways is presented in the publication , Bikeways: Definitions, which is included in Chapter I of this report.

J. SUMMARY

The Bikeways Planning Process described above is aimed at preparing comprehensive bicycle plans based upon adequate citizen involvement, and a knowledge of the relevant problems and opportunities which exist in a project area. Essentially, it is aimed at making communities aware of the options available to them to enable more responsible planning decisions to be made. Although the procedures developed are very simple, when they are presented in the above format and considered in relation to the DPW Transportation Planning Process, they appear to be very complex with many of the basic issues becoming obscured. In an attempt to overcome this problem, the planning process will be summarized and presented below in its simplest form.

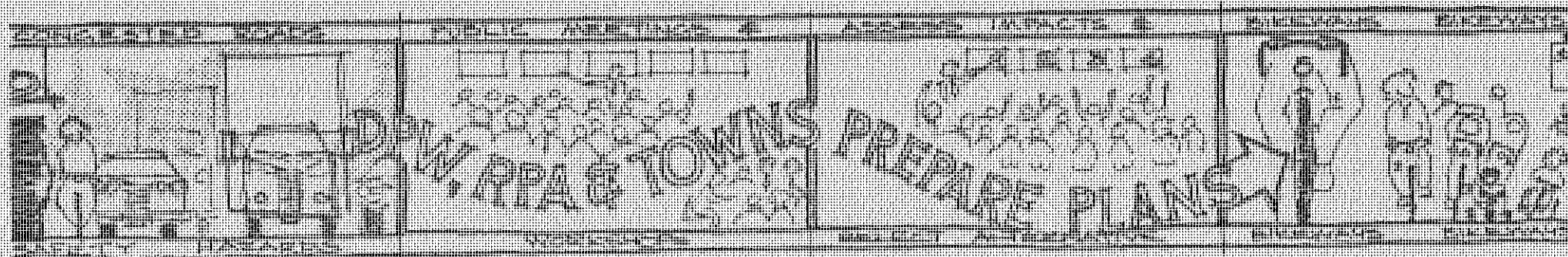
The Bikeways Planning Process has three basic components:

1. The preparation of preliminary bikeway plans by community groups. In these plans high priority routes are identified and planning goals are determined.
2. The selection of several alternative solutions based upon the preliminary plans developed in 1, above and a more detailed analysis and synthesis procedure.
3. The selection of a proposed network of bikeways by consideration of the possible impacts of the alternative routes, and feedback from the communities involved and other concerned state agencies.

Following the selection and approval of a proposal, the project then proceeds to the implementation phase.

DEMONSTRATION PROJECT

This chapter provides a description of the work that has already been undertaken in applying the planning process to a demonstration area and recommends actions for future phases of the work.



APPLICATION OF THE BIKEWAYS PLANNING PROCESS

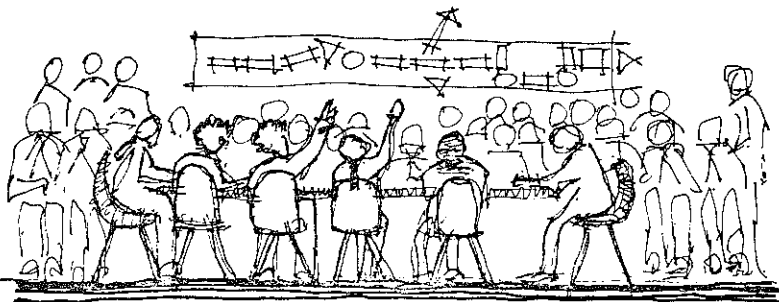
APPLICATION OF THE BIKEWAYS PLANNING PROCESS TO A DEMONSTRATION PROJECT

The purposes of the demonstration project are: (1) to test and modify, where necessary, the planning procedures developed in the Bikeways Planning Model; (2) to provide for continuous evaluation of evolving procedures; and (3) to develop suitable implementation procedures.

Since the planning process relies on town and regional planning agencies' initiative, the progress of a project is not dependent solely on UMass or DPW inputs for its implementation. The response in the demonstration area (Essex County) has been very favorable. Although these planning procedures have only recently been finalized, already two public informational meetings have been held, and the region will shortly initiate demand determination surveying.

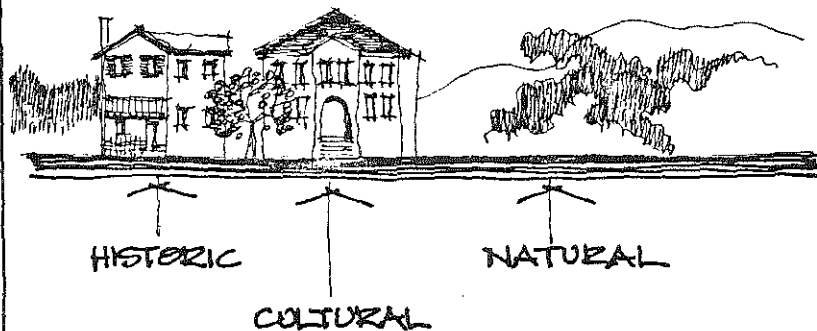
These meetings provided valuable insight into possible future problems. As a result, presentation techniques were improved while the overall model was modified. They also afforded an opportunity to work closely with the DPW liaison and to better understand the DPW transportation planning process and related problems.

Following each meeting, procedural problems that became apparent were documented and, where necessary, alternative strategies recommended for future meetings. Much of this information has previously been submitted to the DPW but is repeated here since many of the issues addressed are vital to successful application of the planning process. In addition, general recommendations are made for future meetings and workshops. However, these recommendations should not be seen as a comprehensive review of public planning techniques. The work of the Public Involvement Group, University of Massachusetts/Department of Public Works Joint Transportation Program deals specifically with this subject and will provide more complete guidelines.



TWO INFORMATIONAL MEETINGS -
PRESENTATION PROBLEMS IDENTIFIED

ESSEX COUNTY BIKEWAY PROJECT



EVALUATION OF PUBLIC MEETINGS

A. THE DEMONSTRATION AREA

Essex County was selected by the DPW, in collaboration with the RPA and TPAG, as a suitable study area. Located just north of Boston (see Figure 13), it encompasses two regional planning agencies, the Merrimac Valley Planning Commission and the Metropolitan Area Planning Commission. It is rich in historic, cultural and recreational resources of varying local, state and national significance; embodies a large range of landscape types and includes urban as well as rural areas. This variety of conditions will ensure adequate testing of the model. Preliminary studies have indicated a need for bicycle facilities, both commuter/utilitarian and recreational/tourist oriented systems. In addition, there is adequate public support for developing a county wide bikeway system.

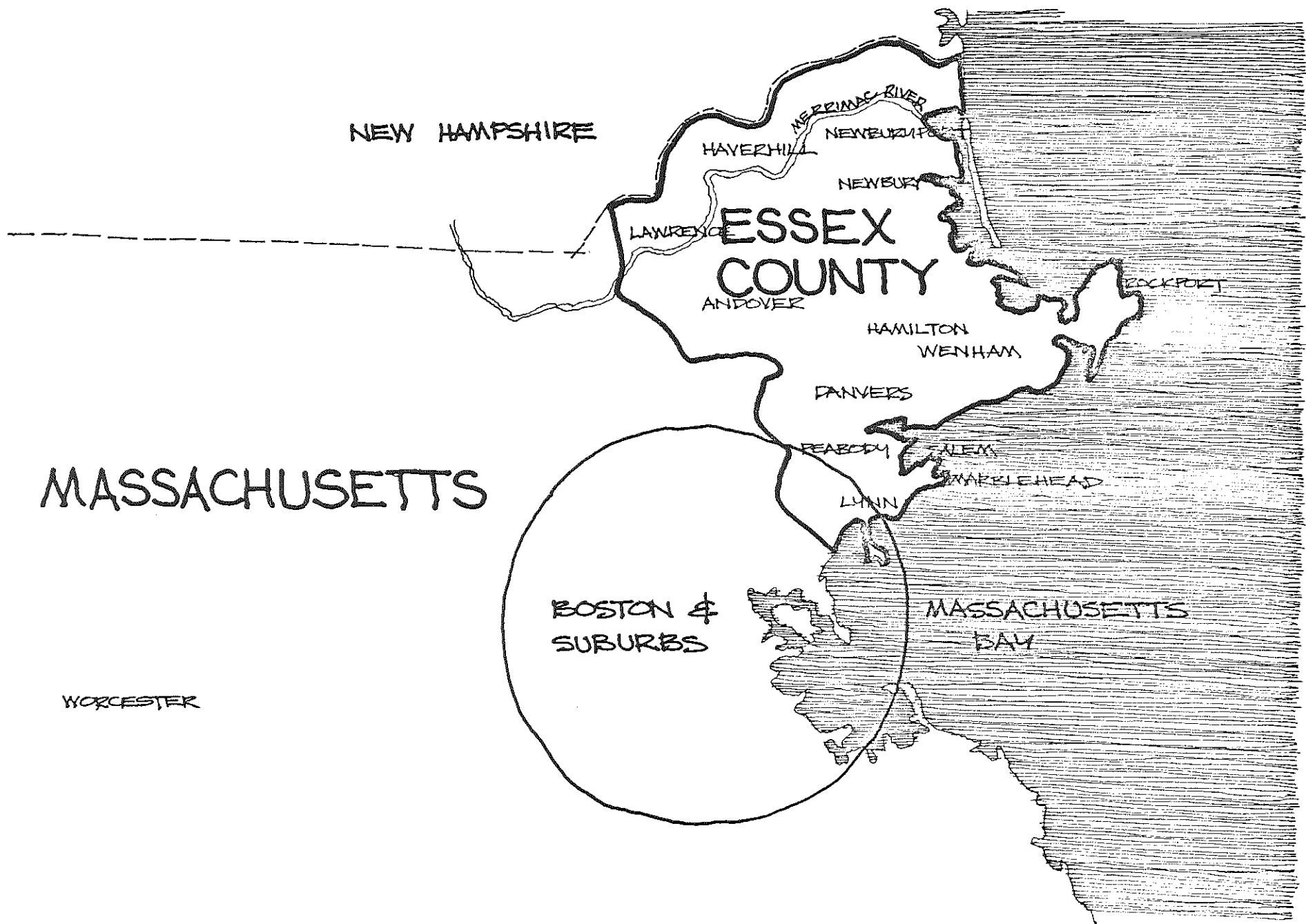
B. EVALUATION OF PUBLIC INFORMATION MEETINGS

1. Salem, Massachusetts, January 16, 1975

(a) Background: This meeting was the first public meeting held in the demonstration area. It was held on a Thursday evening at the Essex County Superior Court Complex, Salem. The purpose was to discuss the ongoing planning efforts in Essex County, bikeways in general, and the options available to communities interested in developing a bikeways system. The meeting was intended as an orientation meeting for town officials and was to provide information on funding and implementation mechanisms, and describe the planning process necessary when state or federal assistance is involved.

The meeting was organized by the County Planner, Thomas J. O'Leary, who has been instrumental in generating interest in bikeways in the region and coordinating planning on a county wide basis.

The Essex County communities represented at the meeting were: Rowley, Beverley, Haverhill, Marblehead, North Andover, Lynn, Saugus, Swampscott, Gloucester, Peabody, Danvers, Salem, Lynnfield, Ipswich and Newburyport. Other communities showing interest but unable to attend were: Andover, Methuen, Boxford, Middleton and West Newbury. Also in attendance were Senator



ESSEX COUNTY, MASSACHUSETTS

FIGURE
13

William Saltonstall (Manchester), a representative of Senator Walter Boverini (Lynn), Ms. H. Marston, a transportation planner from the Merrimack Valley Planning Commission, the County Planner, Ms. K. Marotta, representing the Massachusetts Department of Public Works, and from the University of Massachusetts, Mr. G. Olson, Mr. C. Wren and Mr. R. Petyk.

The County Planner, by way of an introduction, recounted past and ongoing planning efforts in Essex County and discussed the opportunities available to the towns. The UMass Bikeways Team then presented the DPW bikeways Planning Process and information about funding and implementation mechanisms. After a short break, there was a lengthy discussion and question period which provided the opportunity to review what each person at the meeting could do to encourage bikeways planning in their towns and how to involve the DPW in planning bikeways. Preliminary drafts of two publications prepared by UMass were distributed to everyone at the meeting. These reports were entitled: "Bikeways Planning Information: Definitions" and "Bikeway Planning Information: Demand Determination".

According to the majority of the participants and subsequent statements in the press, the meeting was a success. It provided direction to the towns by establishing a structure in which they could work in the form of definite planning guidelines. It was also a valuable learning experience for UMass and the DPW personnel. The purpose of this report is to record some of the problems which occurred and suggest improvements which will begin to establish a framework for future similar meetings.

b. Problems and Recommendations

(i) Problem: The meeting was organized by the County Planner, which is not only at variance with the overall planning process, but may in the future be a source of confusion to those involved in this work.

Recommendations: All future planning meetings supported by the DPW should be organized by the appropriate RPAs, who should encourage all interested parties and other agencies in the region, including county planners, to participate. Apart from

NOTIFICATION OF MEETING

informational meetings to discuss bikeways planning in general, the DPW should not become involved in any project except those sanctioned by the RPA and given a high priority ranking.

(ii) Problem: Notification of the meeting was sent out on Friday, January 10; therefore, most towns received them on Monday, January 13. As Wednesday, January 15 was a holiday, most communities had only two and a half working days notice of the meeting. For many, this was insufficient.

Recommendations: The RPAs should send out notices announcing meetings at least ten days prior to the event. The notice, should, of course, include an agenda and encourage towns to send representatives to the meeting by enumerating the possible advantages of doing so.

PRESENTATION PREPARATION

(iii) Problem: The UMass Bikeways Group was not fully prepared for such a presentation, as it was thought that they were only attending in an advisory capacity.

Recommendations: The various roles of each of the participants must be clearly defined prior to the meeting to enable adequate preparation.

PRESENTATION

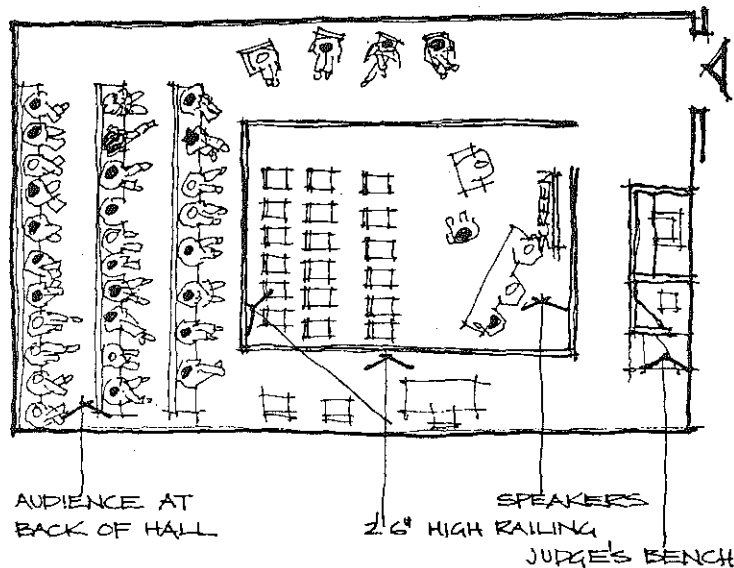
(iv) Problem: The presentation was developed for town officials but the majority of people present were interested individuals and lobby groups. Therefore, some of the material presented may have been too detailed and technical.

Recommendations: If the meeting is intended for town officials, notification of the meeting should be sent only to them. If on the other hand, all interested persons are to be invited, the content of the presentation will need to be changed.

A general discussion about bikeway developments in America supported by adequate visual material should be included in order to create a more stimulating and interactive atmosphere and provide the audience with a sense that they are involved in a process that will result in a tangible solution. This could then be followed by a presentation of the simplified planning process (similar to that presented in Salem).

BIKEWAYS PUBLICATIONS

THE MEETING ROOM



COURT HOUSE, SALEM, MASS.

(v) Problem: The background information and reference materials provided to the meeting participants did not adequately describe the existing planning framework and basis for future actions.

Recommendations: Publications being prepared by the UMass Study Team should provide for these needs in the future and should be made available to communities.

(vi) Problem: The room was not very suitable for such a meeting. The formality and scale of the courtroom created a foreboding atmosphere and stifled all attempts at stimulating discussion which is important with meetings of this nature. The character of a meeting room is an important feature since it contributes to establishing good rapport at a meeting. This is obvious when one considers the circumstances leading up to this meeting. Most of the participants had worked all day, driven miles to the meeting in poor weather, and then had to endure the poor facilities made available. The seating was uncomfortable, the room was excessively hot, while the acoustics and lighting were poor. This is hardly an ideal environment when one is trying to generate enthusiasm and encourage people to take part in a planning process that will involve many similar meetings. The unfortunate seating configuration compounded many of the problems previously mentioned; a low railing divided the space into approximately half, the tables at which the guest speakers were to sit and several chairs and benches were inside the railing, the remainder of the seating was outside the railing at the back of the hall. As no one was present to supervise the seating of the audience, predictably everyone sat outside the railing at the back of the hall.

Recommendations: Select a meeting room more carefully. Something with less of an institutional character is preferable, having relatively low ceilings and reasonable temperature control (68°F). It is also important to have relatively comfortable chairs arranged in an informal manner within close proximity to the speakers. Floor covering, such as carpet, is also desirable to reduce impact noises caused by shuffling, latecomers, etc., and therefore reduce the number of distractions.

It is also essential that someone be available to meet people on arrival and supervise the seating arrangements. In this way,

it would be possible to prevent the back rows of seating being filled and the front rows left empty as occurred in Salem. If this situation arises again, then the audience should be asked at the beginning of the meeting to move forward.

In addition, coffee and other refreshments would make these meetings more pleasant and provide a casual meeting place around the coffee pot during the interval period.

(vii) Summary

All of the above problems may appear to be minor and the recommendations obvious necessities, but it is important that they be incorporated into future meetings. If public meetings are to provide a reasonable forum as part of the planning process, then it is imperative that every effort is made to ensure their success. While it is difficult to ensure participation at such an early stage, doing so will minimize future conflicts. Therefore, once people do show interest, they should not be discouraged by physical discomforts and poor presentations. It is important that the process be not only a rewarding experience but also as pleasant as possible. Perhaps, as a result, more people will then be willing to participate.

2. Haverhill, Massachusetts, February 18, 1975

This meeting was organized by the Merrimack Valley Planning Commission and was held in their offices in Haverhill, Massachusetts. The agenda was similar to the previous meeting held in Salem.

Unfortunately, the meeting was poorly attended with only Amesbury, Andover, Danvers and Haverhill being represented out of the 15 communities in the region. The FHWA was represented by Mr. R.E. Armstrong, the DPW by Mr. P.N. Chapman and Ms. K. Marotta, MVPC by Ms. H. Marston, and UMass by Mr. C. Wren and Mr. R. Petyk.

The poor attendance can be accounted for by the similarity between the two meetings; people who attended the first meeting obviously felt that the second meeting would be repetative and

therefore somewhat redundant. Of interest is that several communities have since expressed regret that they did not attend and indicated had they been aware of the meeting they would have attended.

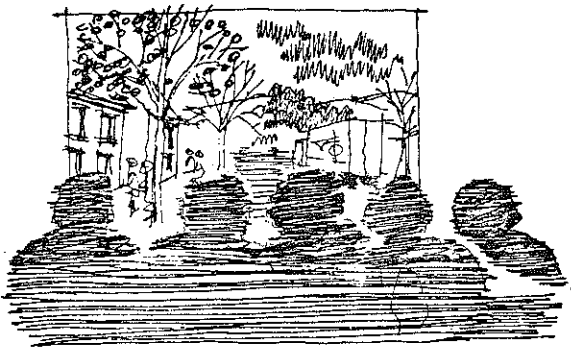
To overcome a repetition of this problem, it is recommended that the RPAs, in addition to sending out notices of the meeting well in advance, contact each town by telephone three or four days before the meeting. This will involve considerable time but it is well worth the investment, particularly during the initial planning phases.

Adequate planning overcame most of the problems of the previous meeting except that little written information was available for dissemination.

In addition to the information presented at the previous meeting, a slide presentation was used as a vehicle for discussing general bikeways planning issues and some of the opportunities available to communities planning bikeways. This presentation was useful as it provided a visual interpretation of many of the factors previously discussed in relatively abstract terms. It is recommended that a similar presentation be used for future meetings. These presentations could serve the following purposes:

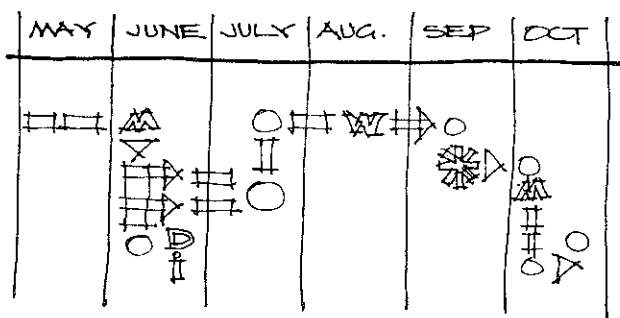
1. Illustrate different types of facilities.
2. Use examples to discuss planning and safety problems.
3. Elaborate upon the opportunities that exist when planning bikeways.

It is suggested that this presentation be a maximum of 20 minutes, use one slide projector and be kept as simple and direct as possible. As its primary objective is to stimulate discussion, the verbal analogue should not be rigidly structured and the audience should be encouraged to ask questions during the presentation.



SLIDE PRESENTATION

C. SCHEDULING



SCHEDULING

**STRATEGIES FOR FUTURE
BIKEWAYS MEETINGS**

AGENDA

KEEP TO TIME LIMITS

**STATE ROLES OF ALL
PARTICIPANTS**

GRAPHIC PRESENTATIONS

The need for a schedule is obvious. Without a definite time frame within which to work, many of the towns, although interested in bikeways, will not take the necessary first steps in the process, which only they can initiate. Following the first meeting, one suspects that those in attendance have a feeling of futility; yes, there is a definite planning process and the DPW is willing to help plan bikeways, but the process is open ended and may take years to complete. In addition, there is no guarantee that the bikeways systems which are planned will be implemented. This must be rectified by providing a schedule which will encourage the towns to take immediate action and thus begin planning their bikeway systems. The question of implementing the plans relates to funding which is a difficult problem and will be discussed in a subsequent chapter.

D. STRATEGIES FOR FUTURE BIKEWAYS MEETINGS

The importance of carefully structuring public meetings to ensure a clear understanding of the information presented and to allow those present to contribute to the proceedings, has previously been referred to. In describing the planning model, the necessary preparation for each meeting was considered but the meeting structure and actual presentation techniques were not discussed.

Although it is not possible to elaborate on all aspects of this topic here, the following basic framework is recommended for future meetings:

1. Send a detailed agenda to all those invited to the meeting.
2. Ensure the meeting starts and ends on time.
3. State clearly the roles of each of the participating groups or individuals.
4. Present information in a way that is clearly understood. With planning work of this nature, visual material specifically prepared for each meeting is essential to explain the complex issues and processes involved.

MEETING ROOM

MINUTES

CHAIRPERSON'S DUTIES

Slides and overhead transparencies should be used to allow the audience to focus on one place rather than having to shift positions to see several diagrams located in different areas of the room. The original maps and diagrams (from which the photographs and transparencies were taken) should also be displayed in accessible locations, for ease of reference at any time during the meeting.

5. The meeting space should be of a suitable size and character (as previously described).

6. Accurate minutes must be taken and later distributed to all participants.

7. A chairperson should introduce the meeting, stating carefully the goals and reviewing past actions. During the meeting, the chairperson should (1) remain impartial, (2) ensure that all discussions are relevant, (3) summarize points made, and (4) encourage participation. At the end of the meeting, the chairperson should (1) review the decisions made, (2) restate post meeting activities and responsibilities, and (3) establish the date of the next meeting.

8. Depending on the type of information being presented, 50 minute to 80 minute work sessions should be considered a maximum. Breaks between sessions should be provided to allow for informal discussion and refreshments.

E. STRATEGIES FOR FUTURE WORKSHOPS

STRATEGIES FOR FUTURE WORKSHOPS

Many of the above comments also hold true for the workshops; however, a slight restructuring is necessary to facilitate greater interaction between participants. The B.A.G. members are the decision makers and must be encouraged to assume this role.

The approach taken by the chairperson will play a key role in assuring the success of the workshops. In workshops, their role requires greater flexibility, acceptance of incomplete ideas and an ability to articulate and translate these issues into questions for the group's consideration.

RECORD ALL DECISIONS & IDEAS GRAPHICALLY

A means of graphically recording all the decisions and ideas made in a workshop is important since it not only provides a record of the meeting, but it ensures that each person's ideas are considered. It also provides an instant recall method that can be used to organize the ideas. In addition, it serves as a psychic release as once the ideas are written down, they become impersonal statements which people generally no longer feel compelled to defend.

ENCOURAGE PARTICIPATION

To prevent the participants from becoming oversaturated with information at any one time and to encourage discussion early in the workshop, it should be structured to form a logical sequence of events, enabling decisions to be made incrementally. Several informational sessions, followed by discussions and decision making periods will be necessary. There are several ways of encouraging all participants to take an active part in the meeting. One technique is to devise tasks for the workshop members who will later present their findings to the entire group. Another is to provide several scenarios, some reasonable and some not so reasonable, to get feedback from the group.

With these suggestions forming a basis for future work, it is recommended that the demonstration project be the vehicle for developing precise techniques for structuring the workshops. In this way, the approach used can be tailored to the information to be presented, the goals of the workshop and the personnel involved.

WORKSHOP TWO (PHASE I)

F. WORKSHOP TWO (PHASE I)

The second workshop is the major decision making session of Phase I and is therefore crucial to the success of the project. It will last considerably longer than the other meetings and workshops. Without having a particular proposal to consider, it is difficult to estimate the time necessary for such a workshop, but it will probably last approximately five hours. Consequently, the logistical problems of arranging such a meeting are numerous. Two possibilities exist; (1) two separate workshops on different evenings or (2) one longer meeting during the day. The latter, of course, is preferable as it provides

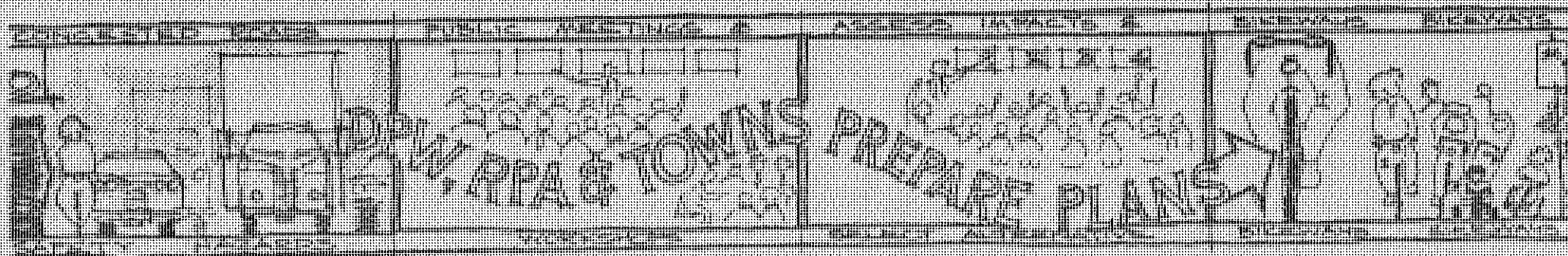
COMPENSATION FOR PRIVATE CITIZENS INVOLVED IN PLANNING WORK

continuity and is probably more convenient for the participants, some of whom will have to travel long distances to attend. It may even be necessary to arrange for a daytime session, followed by an evening meeting. Regardless of the arrangements made for this workshop, suitable refreshments and meals should be provided. This appropriately leads to another related issue, that of compensation for private citizens involved in planning work.

Even though it is reasonable to expect employers to allow employees leave to attend meetings for community based projects, it is unreasonable for them and the participants to bear the full costs involved. Of course, in this particular case, the responsibility for planning-related expenses is debatable. Should the town, the region, or state agency provide the funds? Whatever is the outcome of this jurisdictional problem, participants must be reimbursed for all reasonable expenses (e.g., travel, accommodation, babysitting expenses, meals), as part of the costs of planning bikeways. Failure to do so may discourage many citizens, who may have valuable contributions to make, from participating in the process. This is tantamount to not involving citizens at all. To expand on this notion further, if compensation was paid to private citizens for their time devoted to such projects, perhaps more people would be willing to participate in planning work. Although, this obviously involves initial expenditures not currently incurred, past experience has shown that the savings in time brought about by involving a more representative body of citizens early in the planning process may offset these added costs. Lest this practice be viewed as overly innovative or revolutionary, it should be pointed out that 2,500 years ago, Greek citizens were handsomely compensated for attending town meetings and other governmental functions.

RECOMMENDATIONS & CONCLUSIONS

This chapter provides a description of the problems inherent in bikeways planning in Massachusetts. Recommendations are made to mitigate these problems and a program is suggested for future phases of the study. The recommendations made are considered to be absolutely essential for the planning and implementation of a safe and convenient system of bikeways in Massachusetts.



RECOMMENDATIONS AND CONCLUSIONS

FUNDING

A. FUNDING

CURRENTLY IN MASSACHUSETTS
THERE IS NO FUNDING

HOWEVER THE LEGISLATURE IS
CONSIDERING MAKING MONIES
AVAILABLE FOR THIS PURPOSE.
THE DPW SUPPORTS THIS ACTION.

Experience throughout the country has shown that bikeways are an issue of sufficient local concern to generate action at the community level. Citizens have taken an active part in data gathering and planning for bikeways. However, the limited resources of towns have prevented many of these plans from being implemented. As a result, many communities have turned to state and federal agencies in their search for funds and assistance. Yet although federal and state agencies encourage the provision of bikeways facilities, funds have not been made available specifically for bikeways. Only in a few states (e.g., Oregon) have separate funds been made available for bicycle facilities. Current practices in Massachusetts require that all bikeway related projects compete with other transportation projects for funds. Therefore, many towns are faced with the unenviable task of assessing the need for bicycle facilities in relation to their needs for road maintenance and improvements. However, the legislature is considering including monies specifically for the implementation of bikeway programs in the Accelerated Highway Act. The DPW supports this legislature.

Even when communities do choose to provide bikeway facilities, obscure funding mechanisms and a lack of commitment to bicycles as a viable transportation alternative have been an impediment to actual procurement of monies.

The DPW will provide planning assistance to communities interested in planning bikeways. For all future work, the Bikeways Planning Process developed as a part of this study should be the framework for providing planning assistance. This process determines at an early stage (Phase I) whether a project is a justifiable expenditure. It would then seem reasonable that all projects proceeding to the Project Development Phase (Phase II of the Bikeways Planning Process) be assured of funding.

It is crucial that citizens feel that there is a reasonable probability that their proposals will be funded and therefore

implemented. Without this assurance, the current levels of interest in planning bikeways will not be sustained. Consequently, a potentially beneficial working relationship between the DPW and local communities will not be realized. Conversely, by responding to needs articulated at the community level, the DPW can continue to improve its image as a responsive governmental body. As an aside, one cannot help but remark that expenditures for planning projects which are unlikely to be funded are a less than justifiable use of public funds.

IT IS CRUCIAL THAT FUNDING
PRACTICES CHANGE

RECOMMENDATIONS

DPW SHOULD CONTINUE TO LOBBY
FOR FUNDS FOR BIKEWAYS

DPW FUNDING PROCEDURE
SHOULD BE CLARIFIED

FUNDS FOR COMMUNITY BIKEWAYS

Therefore, unless current funding practices are changed, the DPW should consider abandoning bikeway planning work in favor of other projects more likely to be implemented.

Recommendations:

1. The DPW should continue to actively lobby for the provision of planning and construction funds specifically for bikeways.
2. The DPW should formalize and codify their funding approval mechanism and provide precise guidelines to planners regarding the level of justification required for projects. It is suggested that for bikeways, funding decisions be made on the basis of data gathered in Phase I of the Bikeways Planning Process.
3. That funds be made available for community bikeway systems without limiting them to state numbered roads. This is currently possible with the most recent interpretation of the U.S. Department of Transportation regulations (Section 124 of the Federal Aid Highway Act of 1973). These allow funds to be used for the construction of bikeways and the purchase of rights of way, provided that they are for the use of cyclists who would otherwise have used a federal aid highway.

B. LAND ACQUISITION

The incompatibility of bicycles and automobiles and an evaluation of existing conditions; namely the limited space available within many existing rights of way and the need to provide a continuous systems of bikeways within communities, clearly points

LAND ACQUISITION

USE OF PUBLIC & QUASI-PUBLIC LAND

ABANDONED RAILWAY RIGHTS OF WAY

PRESIDENTIAL ADVISORY COMMITTEE RECOMMENDS USE OF RAILWAY RIGHTS OF WAY FOR BIKEWAYS

RECOMMENDATIONS

DPW SHOULD INVESTIGATE LEGALITIES OF USING PUBLIC & QUASI-PUBLIC LAND FOR BIKEWAYS

to the need for procurement of additional rights of way if appropriate bicycle facilities are to be provided.

Since bikeways generally cause little disruption to existing land uses, public and quasi-public land is often suitable for bikeways (e.g., recreation areas, schools, utility rights of way, canals, and rivers). However, the DPW has been reluctant to construct projects on property over which they do not have complete jurisdiction. This is unfortunate as it is possible to legally obtain easements at less cost than is required for outright purchase of property. Also, this can usually be done with less public opposition.

Abandoned railway rights of way can provide ready made corridors for bikeways; these often parallel state and interstate highways, have gentle grades, connect major resources and facilities and are available at relatively little cost. A Presidential advisory committee supports the use of abandoned railway rights of way for bikeways. In assessing the situation, the Citizen Advisory Committee on Environmental Quality, discovered that the Preliminary National Railroad Plan (prepared by the United Railway Association; released February 26, 1975) propose to add 6200 miles of unprofitable trackage to the thousands of miles of existing abandoned railway rights of way. The report entitled From Rails to Trails (1975) produced by the Committee on Environmental Quality suggests that abandoned railway rights of way be used for biking, hiking and skiing trails. It points out that "the railbeds traverse a variety of landscapes (many of which) are scenic routes passing through picturesque tunnels or over bridges." The report also recommends that the abandoned railway station houses be used as hostels or trail headquarters.

Recommendations

1. The DPW should investigate the legal constraints and problems associated with the use of public and quasi-public land for bikeways.
2. If it is legally possible, the DPW should make use of utility and abandoned railway rights of way, when the demand warrants such actions and where they are appropriately located.

PLANNING

NEED FOR RECREATION & COMMUTER/UTILITARIAN BIKEWAY SYSTEMS

DEMAND STATISTICS INDICATE
THAT LOCAL BIKEWAYS SHOULD
BE THE HIGHEST PRIORITY.
HOWEVER THERE IS A NEED
FOR REGIONAL PLANS TO
ENSURE COORDINATION OF
THE LOCAL BIKEWAY SYSTEMS

RECOMMENDATIONS

USE PLANNING PROCESS
DEVELOPED BY UMASS &
THE DPW

EMPHASIZE LOCAL BIKEWAYS
REGIONAL COORDINATION

C. PLANNING

The planning process is aimed at developing comprehensive bikeways plans which respond directly to demand and are based upon goals identified by the citizen advisory groups. However, some issues require clarification and elaboration.

It is difficult to generalize about the type of bicycle facilities required in Massachusetts since there have been substantial increases in both utilitarian/commuter and recreation cycling. Therefore, the types of facilities required will be identified for each particular project during the planning process.

Previous demand studies, cited in the literature, indicate that very few cyclists will travel more than five miles per journey. One can assume that this data will be applicable to cyclists in Massachusetts. Furthermore, the majority of bicycle accidents occur in urbanized areas. This indicates that there is a need for facilities in these areas to overcome existing safety problems. Therefore, it is apparent that the greatest need for bikeways is at the local community level, rather than at the regional or intertown level. In response the DPW State Plan was developed, with substantial input from the towns as well as the RPAs. It provides continuity at the regional scale while allowing for modification on the basis of community input.

Recommendation

1. The DPW should use the planning process developed to identify the demand for bikeways, to establish planning goals and to plan a comprehensive system of safe bikeways which will complement the existing statewide plan.
2. The DPW, working through the RPA, should concentrate on assisting towns in the development of local bikeway networks rather than long distance intertown systems.
3. By planning comprehensive bikeway plans on a regional level, a phased implementation program can be developed which will enable the high priority local routes to be logically linked at a later date. In this way, regional and state bikeway systems will

**BIKEWAY SYSTEMS SHOULD TAKE
ADVANTAGE OF COMMUNITY
FACILITIES & BE INCORPORATED
INTO OTHER DEVELOPMENTS**

**REST FACILITIES.
SPECIAL TRAFFIC SIGNALS.
INFORMATIONAL & CAUTIONARY
SIGNAGE.**

CONSTRUCTION & SIGNAGE

DESIGN STANDARDS

**ADOPT SIGNS RECOMMENDED
IN THE "MANUAL OF UNIFORM
TRAFFIC CONTROL"**

eventually be developed but the advantages of community based projects will be retained.

4. Bikeway systems should exploit community facilities and resources, and wherever possible, be used to complement other programs. For example, they may be part of an overall tourist/recreational promotional scheme or be incorporated into a redevelopment/rejuvenation project. This can best be achieved via interagency cooperation and coordination of plans and programs.

5. Planning should include consideration of:

- a. Rest facilities providing amenities for cyclists.
- b. Changes to traffic signal sequence which would better accommodate bicycle traffic.
- c. Informational and cautionary signage.

D. CONSTRUCTION AND SIGNAGE

Statewide standards for construction and signage should be adapted to assure that a reasonable level of quality is maintained for all facilities. Signs should be designed to minimize confusion by ensuring that their intent is not misconstrued. Careful location of signs is also necessary.

Recommendations:

1. The DPW should use the standards recommended in this study as a framework for developing a more complete set of design specifications to be included in Standard Specifications for Highways, Bridges and Waterways.
2. The DPW should adopt the standard signs recommended in the Manual of Uniform Traffic Control. Additional signs should be used to provide information about route length, as well as specific attractions made accessible by the route.

SAFETY

A CRUCIAL ISSUE

DPW SHOULD COORDINATE
EFFORTS WITH OTHER STATE
AGENCIES

SAFETY EDUCATION PROGRAM

INCORPORATE BIKEWAYS
REGULATIONS INTO "DRIVER'S
LICENSE MANUAL"

SCHOOL SAFETY EDUCATION PROGRAM

BIKEWAY REGULATIONS IN TOURIST
LITERATURE

E. ASSOCIATED PROGRAMS

1. Safety

While the development of bikeway systems can greatly improve safety conditions for all road users, the full potential of a bikeways program will only be realized in the context of a continuing and comprehensive safety education and maintenance program. The energy generated in the community through the planning process can be directed towards assuring the continuing effectiveness of the bikeways program.

The increased usage of bicycles on roadways has made apparent the limitations of assisting regulations and safety education programs. Automobile drivers and cyclists generally have no clear understanding of their responsibilities to each other. This confusion has contributed to the increased rates of accidents between cyclists and autos, while resulting in a sense of anxiety and mistrust on the part of both parties.

Recommendations:

(a) The DPW should coordinate its efforts with those of the Governor's Safety Council and the Safety Education Division of the Registry of Motor Vehicles to:

(i) Develop a safety education program to inform all road users of their responsibilities to each other. This could be done through a safety brochure receiving wide distribution in the Commonwealth in conjunction with a media oriented safety program.

(ii) Include detailed information dealing with cyclist and motorist responsibilities in the Driver's License Manual. This information should be incorporated into existing drivers' examinations. The manual should specifically mention the four types of bikeways being constructed in this state.

(iii) That in addition to adult safety education programs, existing school safety programs be continued and expanded.

(iv) Insure that official state highway maps and tourist brochures refer to bicycle regulations.

DPW SHOULD NOT EXPEND FUNDS
ON PROJECTS THAT WILL NOT BE
BE ADEQUATELY MAINTAINED &
POLICED

BICYCLE REGISTRATION PROGRAMS
PROVIDE A RECORD OF USERS &
DETER THEFTS BUT THERE ARE
IMPLEMENTATION COSTS WHICH
MAY OFFSET ANY POTENTIAL
FINANCIAL GAINS

TOWN SUBDIVISION REGULATIONS
SHOULD INCLUDE BIKEWAY
REQUIREMENTS

ALL NEW HIGHWAY PROJECTS
& MAINTENANCE WORK
SHOULD INCLUDE CONSIDERATION
OF THE PROVISION OF BIKEWAYS

2. Policing and Maintenance

As discussed in the informational brochure Bikeways Definitions and Their Implications (see Chapter 2 of this report), bikeway programs must consider the related issues of maintenance and policing.

Recommendations: DPW funds should not be expended on facilities for which maintenance and policing responsibilities have not been clearly assigned. Assurances must be given that adequate funding and staff will be provided to perform these tasks.

3. Registration Programs

In many states bicycle registration programs have been looked to as a theft prevention mechanism as well as a source of bikeway construction funds. Although these programs have definite advantages, before implementation in this state, a thorough review of feasibility and of implementation costs will need to be undertaken.

4. Subdivision Regulations

To insure the provision of bicycle facilities in newly developed areas, the DPW should urge towns to incorporate in their subdivision regulations, requirements for bikeways.

5. Highway Construction and Improvements

All plans for new construction or highway improvements should include consideration of their potential for improving bicycling in the region. Specific provisions for bikeways should be included if the route is suitable.

6. Staffing

Although staffing requirements will be determined to some extent by the amount of work generated through the implementation of the DPW Bikeways Planning Process, the following is proposed as a minimum effective staffing level:

DPW STAFFING REQUIREMENTS

ONE SENIOR PLANNER

(a) One Senior Planner to coordinate the overall bikeway planning program.

ONE JUNIOR PLANNER

(b) One Junior Planner to provide liaison with the MAPC, conduct continuing state-of-the-art updating, and prepare legislative and funding proposals.

TWO PLANNING ASSISTANTS

(c) Two Planning Assistants to provide liaison with the remaining RPA's and supervise specific bikeway proposals in their respective regions. These assistants should also serve as intra-agency liaisons with the Bureau of Project Development and the Bureau of Traffic Operations. The planning assistants should be trained in public participatory planning techniques and capable of preparing effective graphic material for use in public meetings. Standard graphic and drafting skills would also be required.

7. Potential Future UMass Input

Experience during the contract year has shown that the work required to fulfill contract commitments in the context of evolving program requirements far exceeded the expectations of all personnel. Therefore in defining workloads in any subsequent years of the contract, a realistic program should be developed which recognizes the need for continuing program evolution and allows the existing standards to be maintained. However, the procedures developed during this year are based upon an evaluation of the state's needs and have adapted the DPW planning process to develop a framework for future work. Should the contract be continued, UMass could provide staff support to the DPW in the following areas:

POTENTIAL UMASS INPUT

STATE OF THE ART

(1) Continued State-of-the-Art Review.

INVENTORY

(2) Application of the inventory methodology to the demonstration area.

APPLICATION OF PLANNING
METHODOLOGY

(3) Continued application of the planning methodology in the demonstration area.

REFINEMENT OF PLANNING METHOD

(4) Refinement of the planning procedures in response to needs perceived in application of the process.

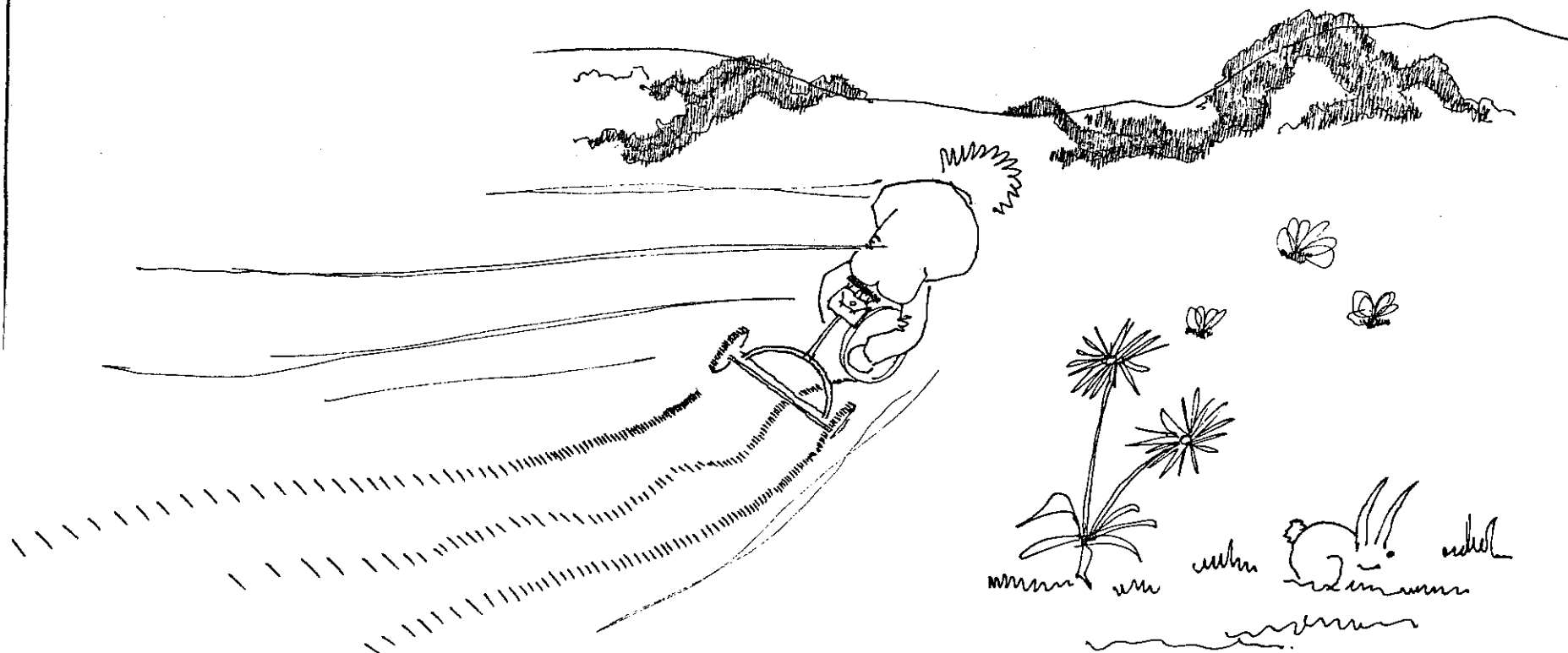
SAFETY PROGRAM

(5) Preparation of a bicycle safety program.

BIKEWAYS & ONGOING HIGHWAY CONSTRUCTION & MAINTENANCE

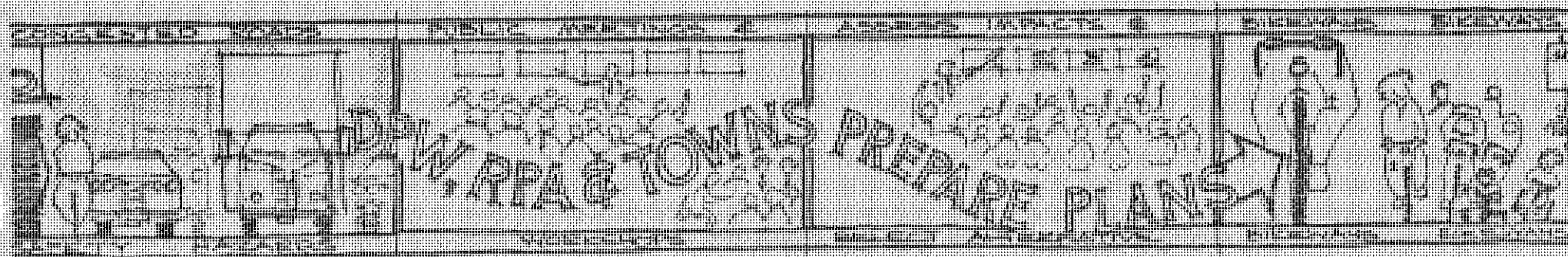
(6) Developing an evaluative procedure for incorporating bikeway facilities into the overall highway construction and improvement programs.

These general work areas are not recommended as a formal work plan but rather as potential directions for future study.



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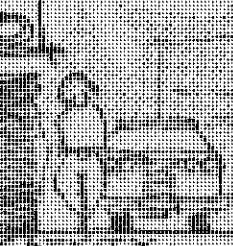
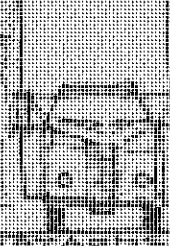
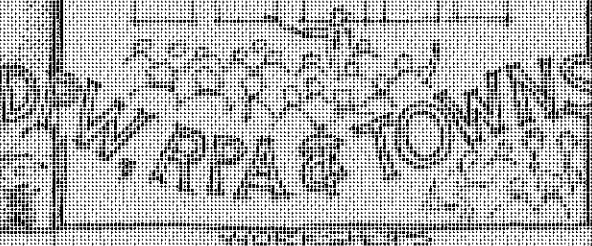
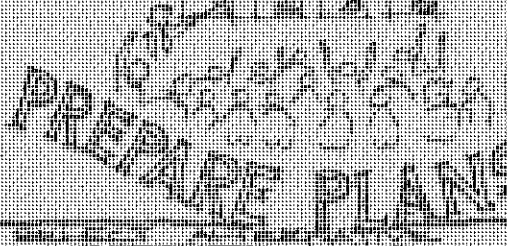

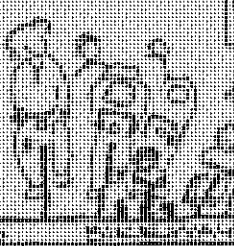
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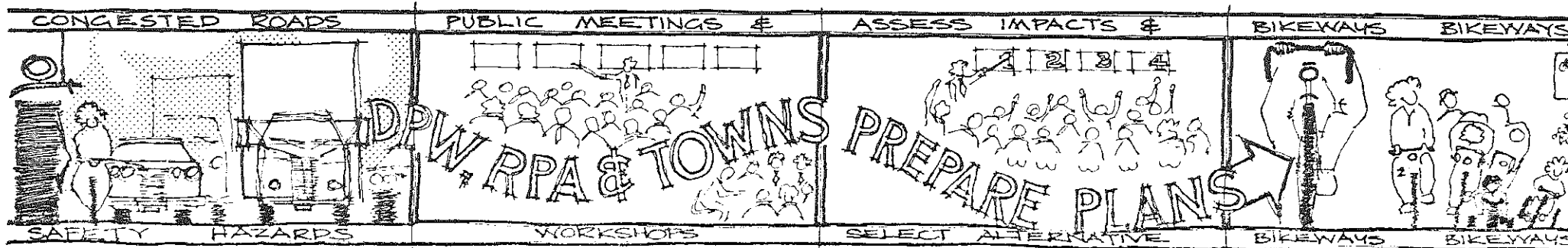
APPENDICES

PROJECTS	ROADS	PUBLIC MEETINGS	ASSESS IMPACTS	DESIGNS	CONTRACTS
					
W. APA & TOWNS					

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
 HIGHWAYS PLANNING INFORMATION APRIL '78

APPENDIX

Included in this appendix are the UMASS/DPW Bikeways Inventory Questionnaires.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

A

BIKEWAYS INVENTORY

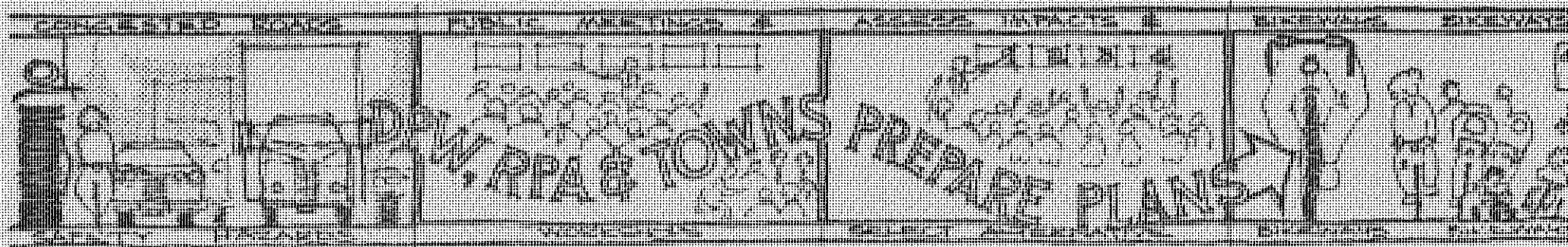
THIS QUESTIONNAIRE SHOULD TAKE APPROXIMATELY 5 MINUTES TO COMPLETE.
FOR EACH PROPOSED OR EXISTING BICYCLE WAY, PLEASE ANSWER THE
FOLLOWING QUESTIONS.

IF YOUR TOWN IS WITHOUT AND HAS NO PLANS FOR BICYCLE FACILITIES,
PLEASE ANSWER THE QUESTIONS IN SECTION E, F, G, AND H.

WHEN COMPLETE, COULD YOU PLEASE RETURN THE QUESTIONNAIRE TO:

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
BUREAU OF TRANSPORTATION PLANNING AND DEVELOPMENT
190 PORTLAND STREET
BOSTON, MA 02114

THANK YOU.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '78

A. QUESTIONNAIRE COMPLETED BY:

1. Name _____
2. Position _____
3. Address _____
4. Phone Number _____

B. WHAT IS THE POPULATION OF EITHER:

1. The town _____
2. Area served by the facility _____

C. INDICATE THE TYPE OF BIKEWAY EXISTING OR PROPOSED (Check appropriate column and state approximate length and completion date, if known.)

	Existing	Proposed	Approximate Length	Completion Date
1. <u>Bicycle path</u> , i.e., a completely separate travel way for the exclusive use of bicycles either:				
a. within an existing right of way (e.g., roads or utility r.o.w.)				
b. within its own right of way				
2. <u>Bicycle lane</u> , i.e., a portion of the roadway set aside for the exclusive use of bicycles, delineated by visual or physical barriers.				
3. <u>Bicycle route</u> , i.e., a travel way shared with automobiles.				
4. <u>Bi walk</u> , i.e., a travel way shared between cyclists and pedestrians, utilizing either:				
a. an existing sidewalk.				
b. an existing right of way.				
c. a separate travel way.				
d. other (specify).				
5. Other type of facility (describe).				

D. WAS THE PLANNING AND DESIGN CARRIED OUT BY:
(Check appropriate item)

1. The town? _____
2. The Department of Public Works? _____
3. The Department of Natural Resources? _____
4. Other state agency (specify) _____

5. Consultant (specify) _____

E. IF THERE ARE NO BICYCLE FACILITIES IN YOUR TOWN
OR ANY PLANNED, ANSWER THE FOLLOWING. IS IT
BECAUSE:

1. There is no need? _____
2. It is considered a low priority item? _____
3. There are inadequate funds? _____
4. There is inadequate staff and/or expertise? _____
5. It is not realized the federal or state funds
can be used in certain circumstances? _____
6. Other reasons (specify) _____

F. WHAT TYPE OF ASSISTANCE WOULD BE MOST HELPFUL?

1. Planning? _____
2. Funding? _____
3. Construction? _____
4. Other (specify)? _____

G. DO YOU HAVE A BICYCLE REGISTRATION PROGRAM?

H. ARE BICYCLES ALLOWED ON SIDEWALKS?

BIKEWAYS INVENTORY

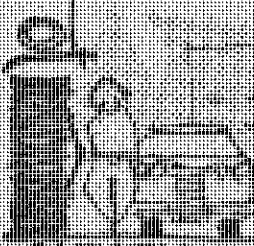
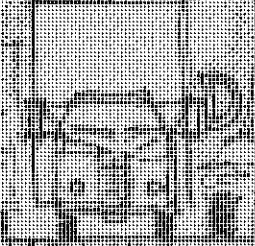
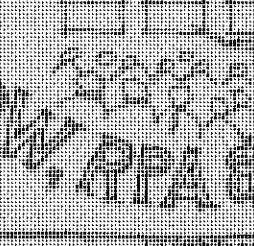
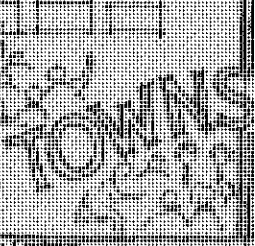
FOR EACH PROPOSED OR EXISTING TYPE OF BICYCLE FACILITY, PLEASE ANSWER THE RELEVANT SECTION. IT IS NOT NECESSARY TO ANSWER EACH SECTION OR ALL OF THE QUESTIONS.

IF YOU WOULD LIKE TO ADD ADDITIONAL COMMENTS OR INFORMATION, PLEASE DO SO.

WHEN YOU HAVE COMPLETED THE QUESTIONNAIRE, LOCATE THE BICYCLE FACILITIES AS ACCURATELY AS POSSIBLE ON THE ENCLOSED MAP OF YOUR TOWN. INDICATE CLEARLY WHICH ARE EXISTING AND WHICH ARE PROPOSED BIKEWAYS AND THE TYPE OF FACILITY PROVIDED. THEN RETURN THE QUESTIONNAIRE, MAP SUPPLIED, AND ANY TOWN MAPS OR PUBLICATIONS WHICH SHOW THE LOCATION OF THE BIKEWAY OR PROVIDES ANY INFORMATION ABOUT THEM, TO:

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
BUREAU OF TRANSPORTATION PLANNING AND DEVELOPMENT
190 PORTLAND STREET
BOSTON, MA 02114

THANK YOU.

CONGESTED ROADS	PUBLIC MEETINGS	ACCESS IMPACTS	BIKEWAYS
			
<p>W. APAS TOWNS</p>	<p>PREPARE PLANS</p>	<p>BIKEWAYS</p>	<p>BIKEWAYS</p>

A. QUESTIONNAIRE COMPLETED BY:

1. Name _____
2. Position _____
3. Address _____
4. Phone Number _____

B. IS THE BIKEWAY: (Check the appropriate items)

1. Primarily for commuter use? _____
2. Primarily for recreation use? _____
3. Within a densely populated area? _____
4. Within a suburban area? _____
5. Within a rural area? _____
6. Located in mountainous terrain? _____
7. Located in hilly terrain? _____
8. Located in flat terrain? _____
9. For exclusive use by bicycles? (If not, please specify other user groups such as cross-country skiers, horses, snowmobiles, etc.) _____

C. IF A BICYCLE PATH, ANSWER THE FOLLOWING:
(Check the appropriate items)

1. If within a roadway right of way:
 - a. Is it limited access highway? _____
 - b. Is it an unlimited access highway? _____
 - c. Is it a secondary road? _____
 - d. Is it a one-way road? _____
 - e. Is it separated from the road by a physical barrier:
 - i. guardrail? _____
 - ii. vegetation? _____

- iii. grade change? _____
- iv. other (specify) _____

f. How far is it from the road (specify) _____

g. Is the road visible from the bikepath? _____

2. If outside a roadway right of way:

a. Does it utilize either:

- i. a utility right of way? _____
- ii. a railway right of way? _____
- iii. other semi-public right of way? (specify) _____

b. Is it on land that was previously publicly owned? (specify) _____

c. Is it on land that was previously privately owned? _____

d. Is it on publicly owned land such as parks, recreation areas, etc.? (specify) _____

e. Was the land purchased by eminent domain? _____

- f. Was the land purchased by agreement? _____
- g. Was the land a gift? _____
- h. Was the right of access and use of the land given but not the title? _____

D. IF A BICYCLE LANE, ANSWER THE FOLLOWING:
(Check the appropriate items)

- 1. Is the road:
 - a. A limited access highway? _____
 - b. An unlimited access highway? _____
 - c. A secondary road? _____
 - d. A one-way road? _____
- 2. Is parking allowed on the roadway? _____
- 3. Is the bikepath located outside a row of parked cars? _____
Is the bikepath located inside a row of parked cars? _____
- 4.a. Were any changes in parking regulations instituted to accommodate the bikelane (specify) _____

- b. Were any changes in traffic circulation instituted as a result of the bikelane (i.e., streets made one-way, etc)? (specify) _____

- c. Which of the following means are used to differentiate bikelane from roadway?
 - i. stripes? _____
 - ii. posted signs? _____
 - iii. stencilled signs on bikelane surface? _____

- iv. physical barriers (specify)? _____
- v. changes in grade (specify)? _____
- vi. changes in paving (specify)? _____
- vii. other (specify) _____

- d. What provisions (if any) have been made for the safety of cyclists at intersections (i.e., additional phases in traffic light cycle, different road circulation, etc.)? (specify)

E. IF A BICYCLE ROUTE, ANSWER THE FOLLOWING:
(Check the appropriate items)

- 1. Is the road:
 - a. A limited access highway? _____
 - b. An unlimited access highway? _____
 - c. A secondary road? _____
 - d. A one-way road? _____
- 2.a. Is parking allowed on the roadway? _____
 - b. Is parking restricted:
 - i. during peak hours? _____
 - ii. on one side of the road? _____
 - iii. on both sides of the road? _____
 - iv. at intersections? _____
 - v. How far from intersections? _____ ft.
- c. Are road markings used? (specify) _____

- d. Were storm sewer grates raised or realigned? _____

- e. State other construction work and modifications performed when converting the road to a bike route. _____

F. IF A BI WALK, ANSWER THE FOLLOWING: (Check the appropriate items)

1. If within a roadway right of way:

- a. Is it a limited access highway? _____
b. Is it an unlimited access highway? _____
c. Is it a secondary road? _____
d. Is it a one-way road? _____
e. Is it separated from the road by a physical barrier:
 i. guardrail? _____
 ii. vegetation? _____
 iii. grade change? _____
 iv. other (specify)? _____

- f. How far is it from the road? _____ ft.
g. Is the road visible from the biwalk? _____
h. Is the biwalk a converted sidewalk? _____

2. If outside a roadway right of way:

- a. Does it utilize either:
 i. a utility right of way? _____
 ii. a railway right of way? _____
 iii. other semi-public right of way? _____
 (specify) _____

- b. Is it on land that was previously publicly owned? (specify) _____

- c. Is it on land that was previously privately owned? _____

- d. Is it on publicly owned land such as parks, recreation areas, etc.? (specify) _____

- e. Was the land purchased by eminent domain? _____
f. Was the land purchased by agreement? _____
g. Was the land a gift? _____
h. Was the right of access and use of the land given but not the title? _____

G. INDICATE DESIGN STANDARDS USED

1. Is the bikeway:

- a. one-way? _____
b. two-way? _____

2. What is the width of the bikeway? (specify) _____

3. What is the maximum slope gradient and over what distance? _____

4. What is the approximate minimum height clearance provided? _____

5. What is the approximate minimum lateral clearance provided? _____

6. What is the pavement surface? _____

H. GRAPHICS AND TRAFFIC CONTROL

(Check appropriate items)

1. Are road markings used? _____
2. Are signs used? _____
3. Do either of the above: _____
- a. mark the route by stating the name of the facility, e.g., bikelane, bikeroute, etc.? _____
- b. mark the route with signs which limit automobiles? _____
 - i. bikes only. _____
 - ii. no parking. _____
 - iii. give way to bicycles. _____
 - iv. other (specify). _____
- c. mark the route with signs which either caution cyclists or limit bicycle use? e.g. _____
 - i. keep within marked lane. _____
 - ii. stop. _____
 - iii. keep right. _____
 - iv. yield. _____
 - v. caution. _____
 - vi. sharp curve. _____
 - vii. other (specify) _____
- d. warn motorists on intersecting roads that they are approaching a bikeway? _____
- e. provide information about the area (e.g., historic areas or areas of natural interest)? (specify) _____

4. Has it been necessary to alter the traffic lights to accommodate bicycles? _____

- a. Increase the length of a particular part of the traffic light cycle? _____
- b. Add another phase to the traffic light cycle? _____
- c. Other (specify) _____

I. WHAT ANCILLARY FACILITIES ARE SPECIALLY PROVIDED AS PART OF THE BIKEWAY?

1. Rest areas with sanitary facilities? _____
2. Rest areas or picnic areas? _____
3. Parking facilities? _____
4. Bicycle racks? _____
5. Bicycle lockers? _____
6. Lighting? _____
7. Trash cans? _____
8. Other (specify)? _____

J. ARE ADDITIONAL POLICE OR SPECIAL POLICE ASSIGNED TO PATROL THE BIKEPATH AREA?

K. IF EXISTING, DOES THE FACILITY REQUIRE MORE FREQUENT OR ADDITIONAL MAINTENANCE THAN ROADS, SUCH AS:

1. Sweeping (indicate how frequent)? _____
2. Pavement repairs? _____
3. Other (specify) _____

L. FOR WHAT REASON WAS THE FACILITY CONSTRUCTED OR FOR WHAT REASONS IS IT PLANNED?

- 1. For safety reasons? _____
- 2. To increase the pleasure of cycling? _____
- 3. For both of the above but primarily number 1? _____
- 4. To attract tourists? _____
- 5. For exercise purposes? _____
- 6. State other reasons: _____

M. WHAT WAS THE PRIMARY PURPOSE OR PURPOSES OF THE FACILITY?

- 1. To connect towns? _____
- 2. To connect schools to residential areas? _____
- 3. To connect residential areas to shops? _____
- 4. To connect residential areas to major industries or industrial parks or other places of business? _____
- 5. To make recreation facilities accessible to cyclists? _____
- 6. To make buildings or sites of historic interest accessible? _____
- 7. To make areas of high scenic value apparent? _____
- 8. Other (specify). _____

N. WAS THE SELECTION OF A ROUTE OR ROUTES BASED UPON: (Check the appropriate item. Any

supporting information regarding subjects covered in this part of the survey would be appreciated.)

- 1. Traffic counts. _____

- 2. Accident data. _____

- 3. Public opinion generated by lobby groups such as:
 - a. Cycling groups? _____
 - b. School committees? _____
 - c. University organizations? _____
 - d. Concerned public officials? _____
 - e. Town meetings? _____
 - f. Active related industries? _____
 - g. Other (specify). _____

- 4. Was public opinion sought through:
 - a. Town meetings? _____
 - b. Newspaper questionnaires? _____
 - c. Street questionnaires? _____
 - d. Postal questionnaires? _____
(Include a sample if b, c, or d were used and if available.)
 - e. Other (specify). _____

O. WHAT WAS THE SOURCE OF FUNDS?

1. Town? _____
2. State? _____
3. Federal? _____
4. Private? _____
5. Other (specify). _____

P. WAS THE PLANNING CARRIED OUT BY: (Check the appropriate item)

1. The town? _____
2. The Department of Public Works? _____
3. Other state agency (specify)? _____

4. Consultant (specify)? _____

Q. WERE THE WORKING DRAWINGS AND DESIGN COMPLETED BY: (Check the appropriate item)

1. The town? _____
2. The Department of Public Works? _____
3. Other state agency (specify)? _____

4. Consultant (specify)? _____

R. ARE THERE ANY PUBLICATIONS:

1. Available to tourists and cyclists to make them aware of the facility? _____

2. Used to inform drivers and cyclists of their responsibilities to each other (specify)? _____

S. IF THE FACILITY IS EXISTING, ANSWER THE FOLLOWING:

1. Do use levels for the facility justify expenditures? _____

2. Has it reduced the number of road accidents? _____

3. Has it encouraged a greater use of bicycles? _____

4. Is it adequate in size for the number of cyclists using it? _____

5. Is it difficult to police? _____

6. Is it difficult to maintain? _____

7. Is the community satisfied with it? _____

8. Are cyclists satisfied with it? _____

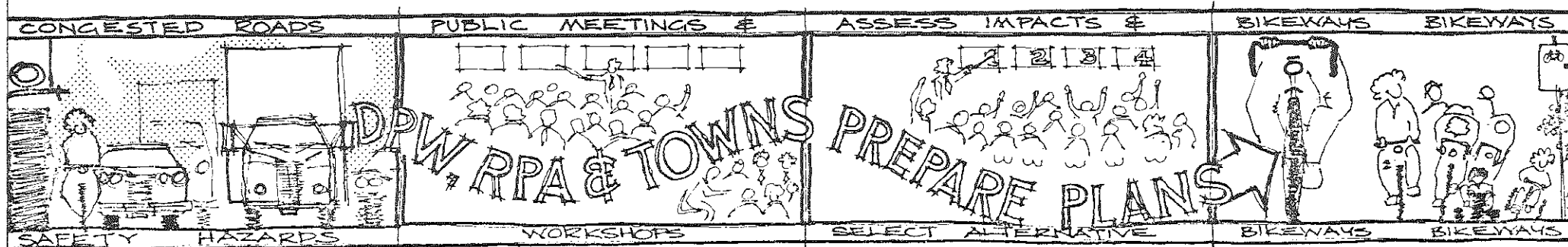
9. Are motorists satisfied with it? _____

10. State other problems and advantages or comment on the above questions in this section.

APPENDIX

Land use classification system - MacConnell et al.
The following is the land use classification system which is used by MacConnell et al. in the preparation of land use maps for Massachusetts. Its purpose is to describe the nature of the land itself, the vegetative cover, or the land use.

There are six major land use categories as described on the following pages.



Agricultural and Open Lands - 11 Types

One way to classify agricultural and open land is by the vegetation which it supports. To a degree, vegetative cover defines the land value, its aesthetic quality, its value for wildlife, and its potential for other uses. Vegetative cover, land use and the nature of the land itself are the basis of all the land classifications in this study.

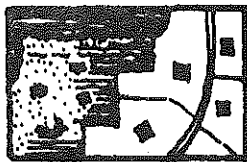
- T - is tilled or tillable crop land which is or has recently been intensively farmed. The boundaries on the ground are usually sharply defined and well maintained because the land is valuable. The land supporting farm buildings is included as part of this type.
- TU - is unused tillable land which has not recently been tilled and is not part of an agricultural unit. This kind of land occurs near growing urban areas and it is usually mowed annually to maintain its value.
- P - is pasture or wild hay land which is not suitable for tillage due to steepness of slope, poor drainage, stoniness, or lack of fertility. This land has less sharply defined boundaries and often has occasional scattered shade trees for the grazing animals.
- AF - is abandoned field which is reverting to wild land. Woody vegetation and grass are abundant but tree crown cover is less than 30%. If the tree crown cover were greater than 30%, the land would be classified as forest. This land is highly productive of wildlife. Most of this land was pasture or wild hay land before abandonment.
- O - is productive fruit orchard.
- AO - is abandoned orchard. In addition to the decadent fruit trees, grass and woody vegetation are abundant in this type.
- CB - is productive cranberry bog. Abandoned cranberry bog soon succeeds to a wetland type usually becoming shrub swamp (SS).
- N - is land supporting nurseries. This type would include greenhouses and land adjacent to them as well as lands supporting horticultural specialties, ornamentals, shrubs and Christmas trees.
- H - is the heath plant community as well as grass, shrubs, and other low vegetation found on poor sandy soils on Cape Cod and the adjacent islands.
- S - is open sand areas which may support scattered herbaceous vegetation. Sandy beaches are a separate outdoor recreation type.
- PL - is powerlines or buried telephone lines, gas or oil pipe lines or other right-of-way 100 feet or more in width maintained through wooded areas. Where powerlines cross agricultural or wetland and require no maintenance they are typed as the vegetative type or the land use permitted under them.

Agricultural or Open land

Fig. 2



T



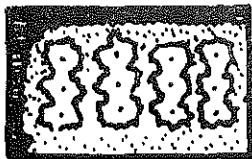
TU



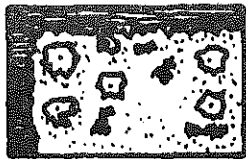
P



AF



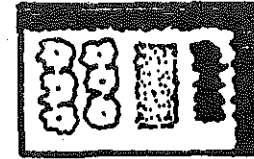
O



AO



CB



N



H



S



PL

Type groups



EA-(P)



IA-(T,TU)



WA-(O,N,CB)



O-(AF,AO,PL,S,H)

The 11 agricultural or open land types are grouped into five types for coloring on 1:24,000 scale maps. These five types will be used on maps made at a later date at a scale of 1:63,360 (1" = 1 mile) and the grouped types will use the symbols shown below. Next to the grouped types in parenthesis is the symbol for the types in the group and next to that is the wax-based Eagle Prismacolor or Castell color pencil used to color the type group. Since there are 28 type groups, careful selection of colors must be made in order for the eye to detect differences between them.

- EA - Extensive Agriculture (P) Eagle 918
- IA - Intensive Agriculture (T, TU) Eagle 941
- WA - Woody Perennials (O, N, CB) Eagle 923
- O - Open Areas (AF, AO, PL, S) Eagle 917
- H - Heath (H) Castell 134

Forest Lands - 40 Types

Forested land is classified by a system which describes the forest by species, height and density. Species differentiation is necessary because some species have greater value for wood products, for wildlife habitat, or have a greater resistance to recreational impact than do others. Height indicates tree size, while density determines light conditions under the stand and the likelihood of lesser vegetation growing under it. Species height and density together help to determine the visual quality of the forest. Tree species groups are designated by letters as follows:

- S - softwoods constitute at least 80 percent of the stand.
- H - hardwoods constitute at least 80 percent of the stand.
- HS - a mixture of hardwoods and softwoods with hardwoods predominating.
- SH - a mixture of softwoods and hardwoods with softwoods predominating.
- P - forest plantations are indicated by prefixing the symbol P to the forest type symbol.

Tree height classes are designated by the numbers 1 through 6.

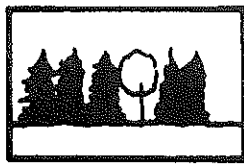
1. 1 ft. - 20 ft.
2. 21 ft. - 40 ft.
3. 41 ft. - 60 ft.
4. 61 ft. - 80 ft.
5. 81 ft. - 100 ft.
6. Uneven heights (three or more height classes represented)

The density classes are designated by letters.

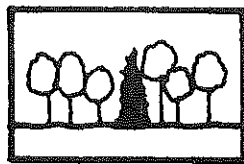
- A. High density, 81 to 100 percent crown closure.
- B. Low density, 30 to 80 percent crown closure.

Density classes are not applied to 1 and 6 height class trees because it is difficult to interpret and not meaningful. This code method of classifying or typing forest stands lists species, height, and then density as in the following examples:

Forest Land *Fig. 3*



S



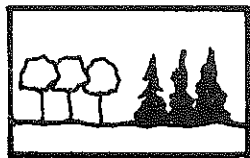
H



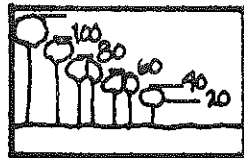
HS



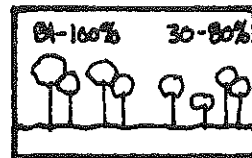
SH



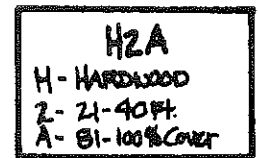
P



HEIGHT



CANOPY COVERAGE



SYMBOL

Type groups



SSF



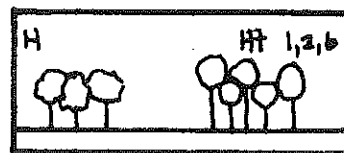
LSF



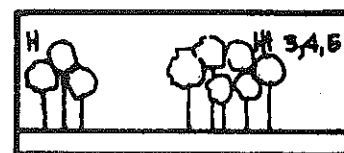
SMF



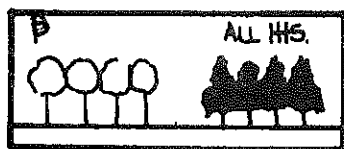
LMF



SHF



LHF



P

H2A is a hardwood stand 21 to 40 feet in height with high density.
HS5A is a mixture of hardwoods and softwoods with hardwoods predominating. The stand is 81 to 100 feet tall with high density.

The 40 forest types are grouped into seven types for coloring on 1:24,000 scale maps. These seven types will also be used on maps made at a scale of 1:63,360 (1" = 1 mile) and the following group type symbols will be used:

SSF - small softwood forest (S) 1, 2 and 6 heights Castell 161
LSF - larger softwood forest (S) 3, 4 and 5 heights Castell 155
SMF - small mixed wood forest (SH and HS) 1, 2 and 6 heights Castell 167
LMF - larger mixed wood forest (SH and HS) 3, 4 and 5 heights Eagle 911
SHF - small hardwood forest (H) 1, 2 and 6 heights Eagle 913
LHF - larger hardwood forest (H) 3, 4 and 5 heights Eagle 910
PF - plantation forest (P) all plantations Eagle 944

Wetlands - 11 Types

The wetland classification is a modification of that used by the Office of River Basins of the U. S. Fish and Wildlife Service. That classification was simplified so that wetland separation could be accurately made on the 1:20,000 scale aerial photographs used in the study. Wooded swamps may be located by forest type symbols over the swamp symbols shown on the underlying U.S.F.S. map. Areas of wooded swamps are not kept separate from other forested areas in this study. The swamp situation on the U.S.G.S. maps is not verified by photo interpretation since wooded swamps cannot be interpreted on "leaves on" 1:20,000 scale air photos. They can be interpreted on 1:12,000 or larger scale "leaves off" spring photography.

- SF - is seasonally flooded basins or flats. This type occurs principally on stream floodplains and the most common plants are grasses and herbaceous species. The soil is waterlogged or covered with water during spring freshets, but well-drained during the growing season. This type is difficult to recognize on summer aerial photographs because it does not support a distinctive vegetation complex.
- B - is bog. The typically acid, peaty soil is waterlogged and supports a distinctive plant community which usually includes most of the following: heath shrubs, cranberries, pitcher plants and sedges. Scattered black spruce, tamarack and red maple may be present. A mat of sphagnum moss is the most characteristic feature of bogs.
- SS - is shrub swamp. The soil is waterlogged during the growing season and is often covered with as much as six inches of water. Common woody species are alder, buttonbush, dogwood and willow. Sedges are usually present in tussocks.
- M - is meadow. The soil is waterlogged through most of the growing season and surface water is present only for a short period during the spring. Vegetation is predominantly grasses, rushes and sedges. Rushes, which grow in the wetter parts of many meadows, photograph very darkly making this type easy to identify.

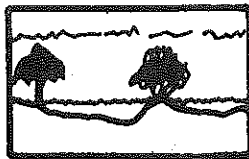
Fresh and salt water wetlands *Fig 4*



SF



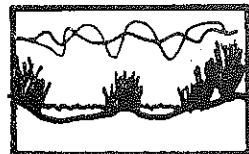
B



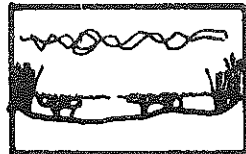
SS



M



SM



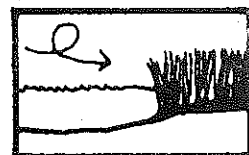
DM



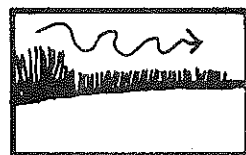
W



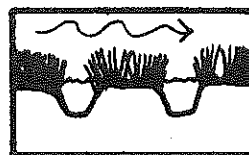
BP



TSM

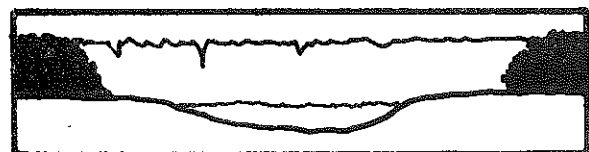


ISM

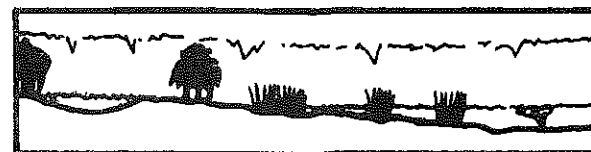


DSM

Type groups



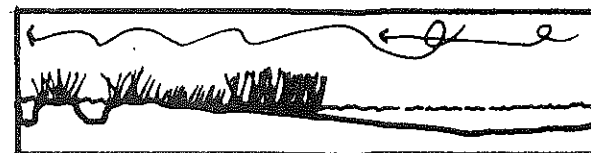
W-(W)



FW- (SS,M,SM,SF)



DW- (DM,B,BP)



SW- (TSM,ISM,DSM)

- SM - is shallow marsh. This type is wetter than meadow. The soil is completely waterlogged and often covered with up to six inches of water during the growing season. There is usually some open water and the predominant vegetation is emergent, including such plants as cattails, bulrushes, burreed, pickerelweed and arrowhead with some grasses and sedges present.
- DM - is deep marsh. Water depth ranges from six inches to three feet. Fairly large open water areas are bordered by, or interspersed with, emergent vegetation like that found in shallow marsh. Floating and submergent plants such as water lilies, duckweed, watershield and pondweeds are also present.
- W - is open water in lakes, rivers and large streams. Water depth is greater than three feet during the growing season. The boundary of coastal water is located by drawing a line at the river mouth to connect the edges of the coastline, or man-made features like roads, railroads or bridges crossing rivers or inlets are used to establish it.
- BP - is beaver pond. These ponds resemble one or more of the above types but they owe their origin to beaver.
- TSM - is tidal salt marsh which is flooded twice daily. Vegetation is primarily saltmarsh cordgrass.
- ISM - is irregularly flooded salt meadows, flooded at monthly high tides and during severe storms. Vegetation is primarily saltmeadow cordgrass, saltgrass and black rush.
- DSM - is ditched salt meadow which has been ditched for mosquito control or for agricultural purposes. Vegetation is the same as ISM.

The 11 wetland types are grouped into four types for coloring on 1:24,000 scale maps. These four types will be used on 1:63,360 scale maps employing the following group type symbols:

- W - open freshwater (W) Eagle 919
- FW - shallow freshwater wetland (SS, M, SM, SF) Eagle 920
- DW - deeper freshwater wetland (DM, B, BP) Eagle 906
- SW - saltwater wetland (TSM, ISM, DSM) Eagle 933

Mining or Waste Disposal Areas - 5 Types

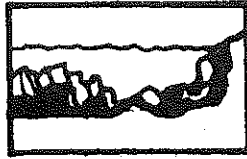
Mining in Massachusetts is mainly for sand, gravel or stone. Waste disposal areas occupy much space and they usually have unsightly characteristics.

- SG - Sand or Gravel - This land is used for the extraction of sand or gravel.
- OM - Other Mining - This land is used for the extraction of stone and materials other than sand or gravel. Mining sites, though ugly to most, are fascinating to rock collectors.

Mining and waste disposal areas *Fig 5*



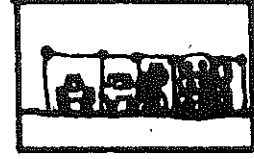
SG



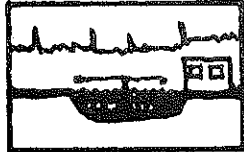
OM



D



DA



FB

Type groups



M- (SG, OM)



WD-(D, DA, FB)

D - Dump - This land is used for dumping waste and refuse materials such as tin cans. Active sanitary land fills would fall into this class. Once revegetated, these lands fall into one of the other land-use categories.

DA - Automobile Dumps - Automobile graveyards or active automobile junk yards.

FB - Filter Bed - This is land and associated buildings used for treating liquids containing organic or chemical matter.

The five mining and waste disposal types are grouped into two types for coloring on 1:24,000 scale maps and the following group symbols will be used on 1:63,360 scale maps:

M - Mining land (SG, OM) Eagle 914

WD - Waste disposal (D, DA, FB) Eagle 948

Urban Land - 22 Types

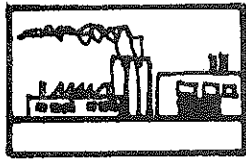
Land classified as urban for the most part encompasses a large number of people living and working in closely ordered structures in a confined land space. Urban limits are at the border of the block street pattern or just beyond it. Each urban type includes the access roads, parking facilities and other features which go with the complex. Industrial, commercial, residential and transportation lands make up the urban type.

UI - is heavy industrial land containing facilities for the manufacture, storage and assembly of raw or partially processed products such as machinery, metals, chemicals, petroleum, or electrical power. Such industries often have large smokestacks and large storage areas. Warehouses and transportation facilities for bulk products and an open and interrupted street pattern characterize this type. Air and water pollution as well as unsightliness are often characteristics of heavy industry.

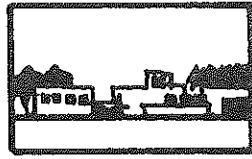
UL - is light industrial land containing facilities for the manufacture or assembly of smaller, partially processed products such as electronics, appliances, and other secondary process products. Large smokestacks or raw material storage facilities are never present, air and water pollution are seldom a problem, and light industries are not apt to be unsightly. Many modern light industries are well landscaped and are indistinguishable from commercial activity on aerial photographs.

UC - is commercial land predominantly used for distribution, or merchandizing goods and services. Stores, hotels, offices, parking garages, apartment buildings and smaller warehouses are usually set close to streets having a close pattern. Trees are rare in downtown commercial areas. Most of the city people not living in residential areas live here. This type includes modern, landscaped commercial buildings away from the urban core.

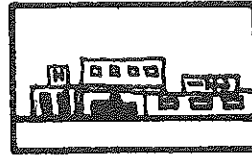
Urban Lands *Fig 6*



UI



UL



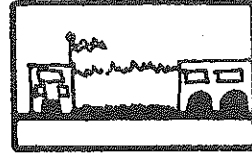
UC



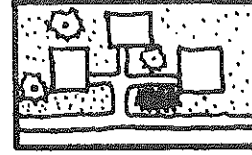
UH



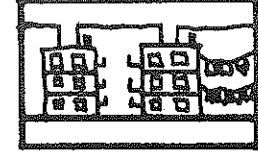
US



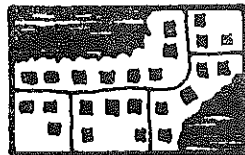
UP



UA



UT



URH



URM



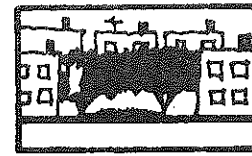
URL



URO



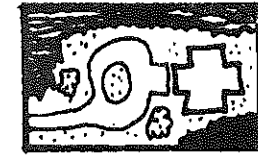
URF



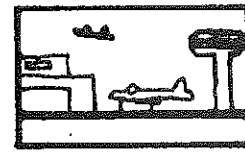
UO



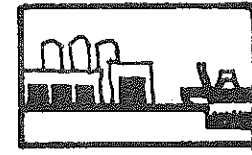
UCR



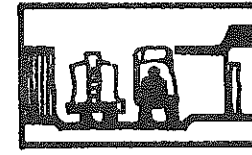
UE



UTA



UTW

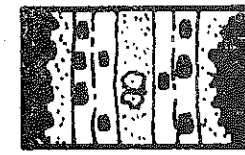


UTR

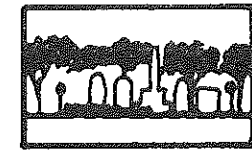


UTT

type groups



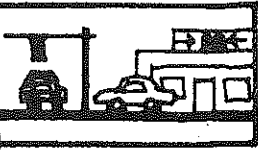
HW



+



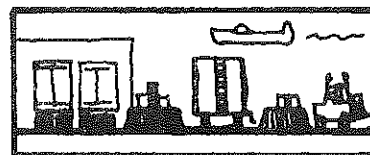
UI-(UI, UL)



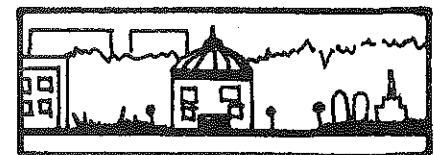
UE-(UE, UH, US)



UA-(URH, URM, URL, URO, URF, UA)
UA, UT, UCR, UE



UT-(HW, UTT, UTR, UTA, UTW)



UO-(UO, UP, +)

- UH - is highway commercial land used for merchandizing goods and services to the traveling public away from urban centers. Gas stations, motels, restaurants, drive-ins and stores located in strips along major routes of travel make up this type.
- US - is shopping centers away from the urban core which are surrounded by large parking lots and may have some landscaping and trees as part of the complex. Theatres are often located in shopping centers to take advantage of the parking.
- UP - is public or quasi-public land with "grounds" and green space which contains facilities to serve large numbers of people. Examples are: schools, colleges, churches, hospitals, state hospitals, prisons, etc. When located in the urban "core," public buildings without "grounds" cannot be identified on air photos and they would be classified UC.
- UA - is "garden" apartments which are usually located outside the "core" city, are set back from the street, have some "grounds" and may have attached recreational facilities like swimming pools and tennis courts. Apartments without "grounds" in the "core" city are typed UC.
- UT - is tenements, town or row houses or apartment buildings set close to streets having a close pattern. They are for the most part three or more stories in height which helps distinguish them from URH, which are less than three stories tall. Some goods or services are sold here, but the area is predominantly used for high density urban living.
- URH - is high density urban residential land used for homes which are spaced closely, set back from the street, and arranged in orderly rectangular patterns on lots less than 1/4 acre in size. Nearly all the street frontage for these building lots is in the vicinity of 50 feet and many of the streets are laid out at 200' intervals. There are about eight dwelling units per acre. These are usually located in older urban areas, or are cottages near the ocean, or are mobile home parks.
- URM - is medium density residential land used for homes which are spaced closely and arranged in orderly curved or rectangular patterns and set back from the street on lots which are predominately 1/4 or 1/2 acre in size. Most of the street frontage is 100' in width and there are two to four dwelling units per acre.
- URL - is light density residential land with lot sizes from 1/2 acre to one acre in size. Most of the lots are one acre in size and there is one dwelling unit per acre.
- URO - is open, very light density residential land with large lots from one acre to two acres in size.
- URF - is very light density, forested, residential land with large lots greater than one acre in size with forest cover. In this type only space for the house and a small lawn are cleared in the forest. More than 75% of the forest is left intact in this type where the lots are predominantly two acres in size.

- UE - is estates three acres or more in size with extensive lawns, gardens, shrubs and other "grounds."
- UCR - is clustered residential land with clusters of three to ten domestic dwellings in farming or forested areas.
- UO - is open undeveloped land which is lying idle in the midst of urban areas or adjacent to them. Such land awaits an opportune time for development. This type includes land which has been cleared for urban development of an unknown kind.
- UTA - is airports with landing strips, hangers, parking areas and related facilities. Small airfields without runways, hangers or other specialized facilities are not typed as airports.
- UTW - is docks, warehouses and related land-based storage facilities for water transportation and commercial fishing. Liquid storage facilities like tank farms may be part of this type.
- UTR - is railyards, terminal freight and storage facilities as well as rail stations for passengers. This type may include liquid storage facilities like tank farms.
- UTT - is terminal freight and storage facilities for truck freight including liquid storage facilities. Bus terminals are included in this type. Transportation facilities which are part of an industrial complex are included as part of the industrial type.
- HW - is divided highways with 200 feet or more of right-of-way width. Narrower roads show on U.S.G.S. maps, but do not have their right-of-way mapped or measured for area.
- † - is cemeteries. The cross symbols for older cemeteries are already on the U.S.G.S. base map. New cemeteries are added to the map. The area of cemeteries greater than 3 acres in size is measured.

The twenty-two urban types are grouped into six types for coloring and the following group symbols will be used on 1:63,360 scale maps.

- UI - Industrial land (UI, UL) Castell 127
- UC - Commercial land (UC, UH, US) Eagle 922
- URD - Dense, residential land (UA, UT, URH) Castell 183
- URL - Low density residential land (URM, URL, URO, URF, UE, UCR) Eagle 916
- UT - Transportation land (UTA, UTW, UTR, UTT, HW) Eagle 967
- UO - Urban open (UO, UP, †) Eagle 908

Outdoor Recreational Facilities - 15 Types

Outdoor recreation types are either water based, mainly for participation, mainly for spectators, or are environmental in character. Each recreational type includes the recreational complex: access roads, parking facilities, buildings and other related facilities. State parks, state forests, or town forests are

typed as forest land since they have no distinguishing features on aerial photographs. Many of these, however, are shown on the U.S.G.S. base maps, but their area would be computed as forest in this study. Campgrounds were not typed because they could not always be located under forest canopies.

Water based recreation

RM - is marinas or boatyards.

RFB - is freshwater sandy beach. This type includes bathhouses, parking and related facilities.

RSB - is saltwater sandy beach. This type includes bathhouses, parking and related facilities.

RS - is swimming pools. The complex including bathhouses and parking facilities must be three acres or more in size to appear on the maps.

Participation recreation

RC - is tennis courts. The complex must be three acres or more in size to be mapped.

RG - is golf courses. This type includes the club house and associated recreation facilities. If tennis or swimming facilities at country clubs exceed three acres they will be typed as RC or RS; if not, these recreation facilities will be part of the RG type.

RD - is golf driving ranges, skeet shooting ranges, archery ranges, etc.

RPG - is playgrounds. Playgrounds have a conglomeration of many types of facilities which may include tennis courts, swimming pools and athletic fields. If, however, any of these are three acres or more in size, they are separated out.

RSK - is ski areas for alpine skiing or ski jumping. This includes ski trails with the wooded space between them as well as the base facilities and parking area. Cross-country skiing trails cannot be located on air photos.

Spectator recreation

RT - is race tracks for horses, dogs or cars.

RA - is athletic fields and stadiums.

RAP - is commercial amusement parks.

RFG - is fairgrounds for agricultural fairs.

RI - is drive-in theaters.

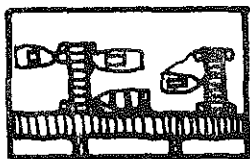
Environmental recreation

RP - is an urban park or "common" which is intensively used "green space" in the city. A zoo would fall in this class.

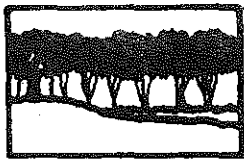
The 15 recreation types are grouped into four types for coloring and the following symbols will be used on 1:63,360 scale maps:

WR - Water based recreation (RM, RFB, RSB, RS) Eagle 929
PR - Participation recreation (RC, RG, RD, RPG, RSK) Eagle 932
SR - Spectator recreation (RT, RA, RAP, RFG, RI) Castell 130
ER - Environmental recreation (RP) Eagle 934

Outdoor recreation facilities *Fig. 7*



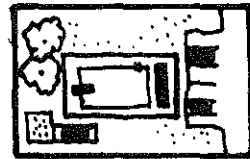
RM



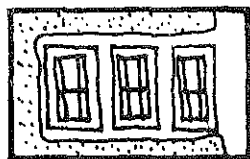
RPB



RSB



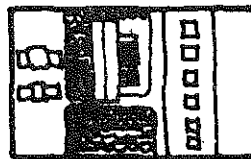
RS



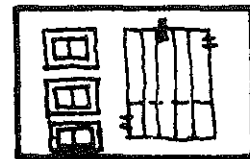
RC



RG



RD



RRG



RSK



RT



RA



RAP



RFG

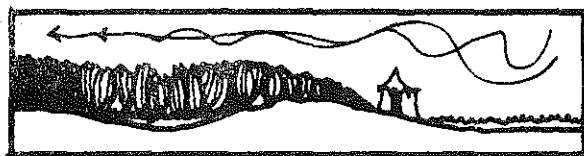


RI



RP

Type groups



WR- (RM, RPB, RSB, RS)



PR- (RC, RG, RD, RRG, RSK)



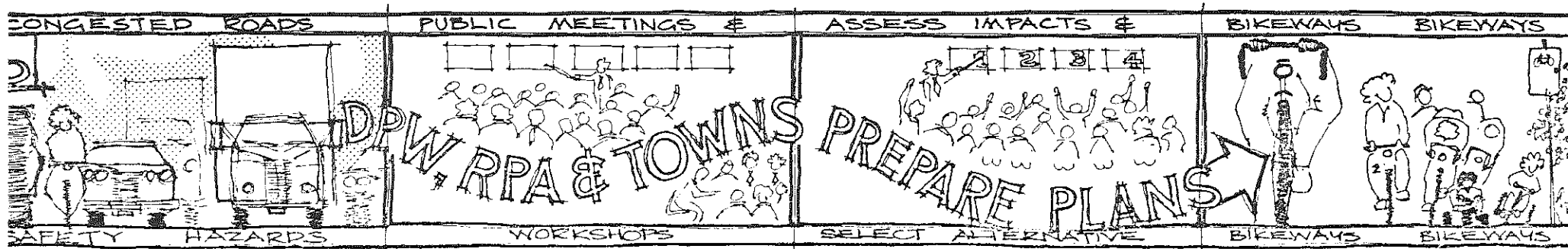
SR- (RT, RA, RAP, RFG, RI)



ER- (RP)

APPENDIX

Included in this appendix are the Scenic Definitions
(Denig, Holden, 1975).



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

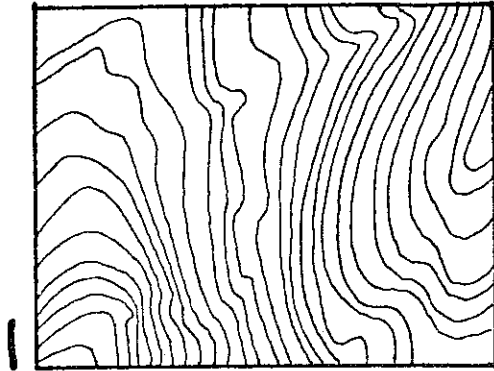


FIGURE 7

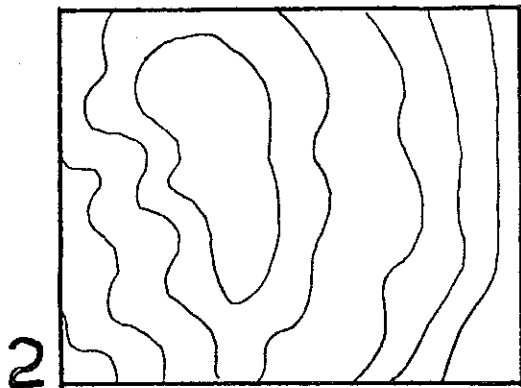
TERRAIN LANDSCAPE TYPES COMPONENTS

TYPICAL PLAN VIEW

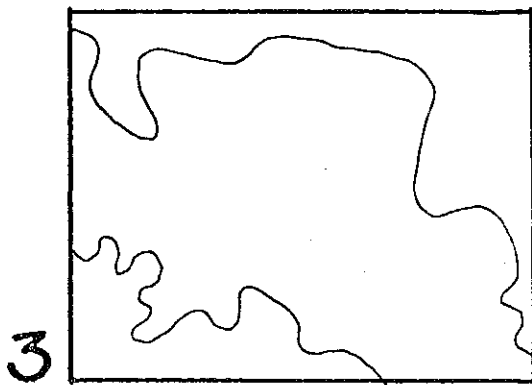
DESCRIPTIVE CRITERIA



1 STEEP HILLS: This terrain type is marked by hills of approximately 500 feet of relative elevation and whose slopes are mostly greater than 10%, averaging between 15 and 25%. Crestlines are often quite rugged in appearance. There are many valleys, most of which are narrow, c. $\frac{1}{2}$ to $\frac{3}{4}$ miles wide at the valley floor. Some small plateau areas may be present within this landscape. Rough or jagged peaks can often be a feature of this steep hill category, giving this type a mountainous appearance, e.g. the Taconic region.



2 ROLLING HILLS: This terrain type differs from steep hills primarily on the basis of its softened and more regular configurations. Some slopes may reach 20%, but most will be below 10% on the average. Valley floors in rolling hill regions will be less constricted than those in the steep hills areas, averaging from 1 to 1 and $\frac{1}{2}$ miles across and perhaps even greater.

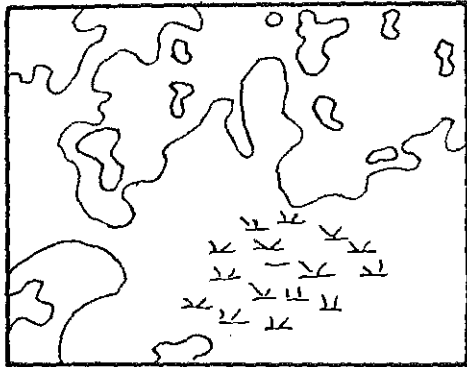


3 UNDULATING AND FLAT LAND: Variations in elevation average less than 200 feet, and may be almost imperceptible in some areas. Although some well-defined hills may be present, they are conspicuous anomalies. Valleys are quite expansive and almost undefined, basically of the low-profile flood plain variety. There is no true sense of valley enclosure in this type, although variations in the ground plane coupled with immediate out-and-fill of the road, may be sufficient to act as an occasional screen for views to the immediate highway corridor in many specific cases.

FIGURE 7

TERRAIN LANDSCAPE TYPES COMPONENTS, CON'T.

TYPICAL PLAN VIEW



4

DESCRIPTIVE CRITERIA

4 COASTLINE: This refers to the entire 'coastal zone' which includes the ocean shoreline, the contiguous beach/dune area, back dunes and tidal marshes, estuary districts and the generally flat areas near the coast. The ocean is always nearby, if not actually present. Where delineation of the coastal zone is difficult, a line 10 miles from the shoreline can be employed to simplify delineation of the coastline type from the interior flat and undulating land areas.

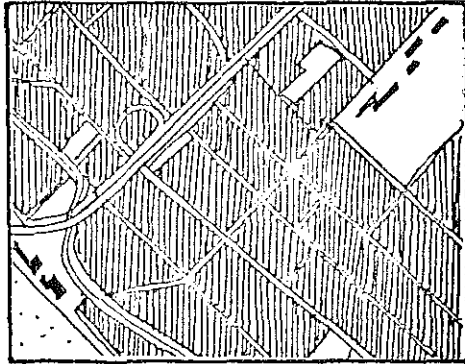
FIGURE 8

LAND USE LANDSCAPE TYPE COMPONENTS

TYPICAL PLAN VIEW

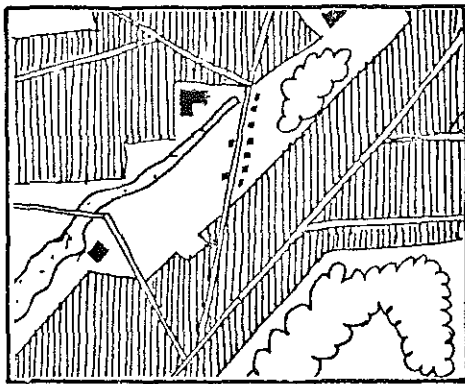
DESCRIPTIVE CRITERIA

A



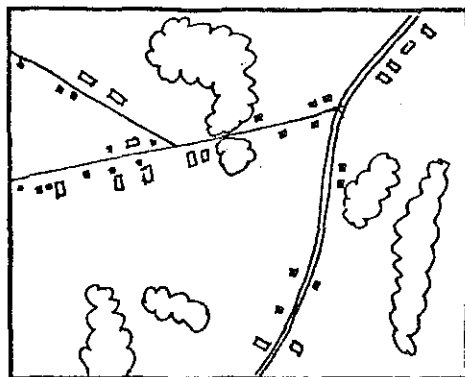
A. METROPOLITAN: This is an expansive urban development whose pattern falls into the typical inner city/ city neighborhoods/suburban pattern. Suburban fringes will also be marked by rapid development especially along major highways. In Massachusetts, only 3 areas fall into this type: greater Boston, Worcester, and Springfield.

B



B. REGIONAL CITY: This type is marked by an urban core with a large commercial and public building complex. Regional cities may have small "suburban" attachments but population densities and the extent of development is much lower than the metropolitan type- Examples in Massachusetts would be Pittsfield, Northampton, Greenfield, Fitchburg, Brockton, and Fall River.

C



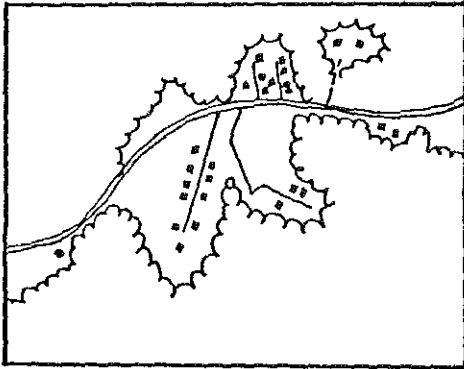
C. TOWN-FARM: This landscape is typified by small concentrations of development from small dispersed village centers to concentrations up to several thousands in population within a basically open rural landscape context ("Farm" here refers to tilled land, pasture land, truck farm areas, and natural meadows and is actually any sizeable area of open-space). About 1/3 to 1/2 of the land is in consolidated open space districts. Examples would be Hadley, Sunderland (southern half), Hatfield, Amherst would still be a town-farm landscape although it is rapidly changing into a regional city due to extensive growth patterns in recent years.

FIGURE 8

LAND USE LANDSCAPE TYPE COMPONENTS, CONT.

TYPICAL PLAN VIEW

D

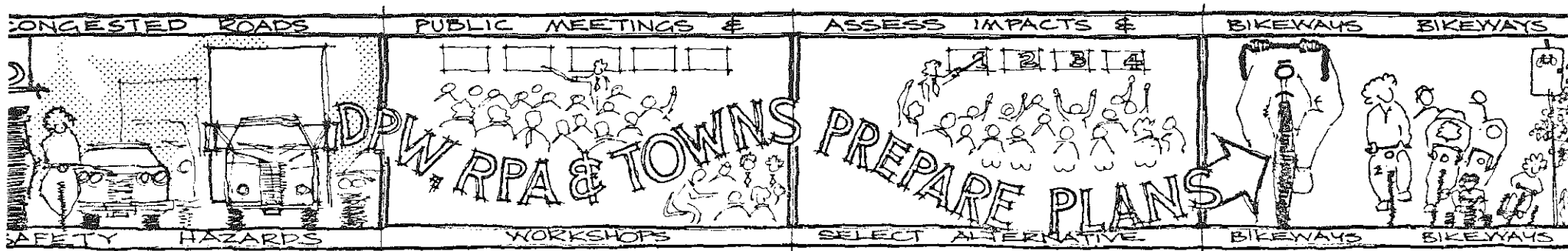


DESCRIPTIVE CRITERIA

D. TOWN-FOREST: Probably the most typical single landscape in Massachusetts, town-forest land-use patterns have the same development pattern as town-farm areas. But such population concentrations occur in a generally closed context due to heavy tree cover. While sizeable cleared spaces may be interspersed within the wooded areas, they are infrequent and rarely extensive enough to create a feeling of openness. A strong sense of enclosure is generally only modified by topographic variation which raises and lowers the tops of the treeline. Examples would be Conway, Shutesbury and Williamstown.

APPENDIX

Included in this appendix are the UMASS/DPW Bikeways
User Questionnaires.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

D

BIKEWAYS QUESTIONNAIRE

= HOUSEHOLD =

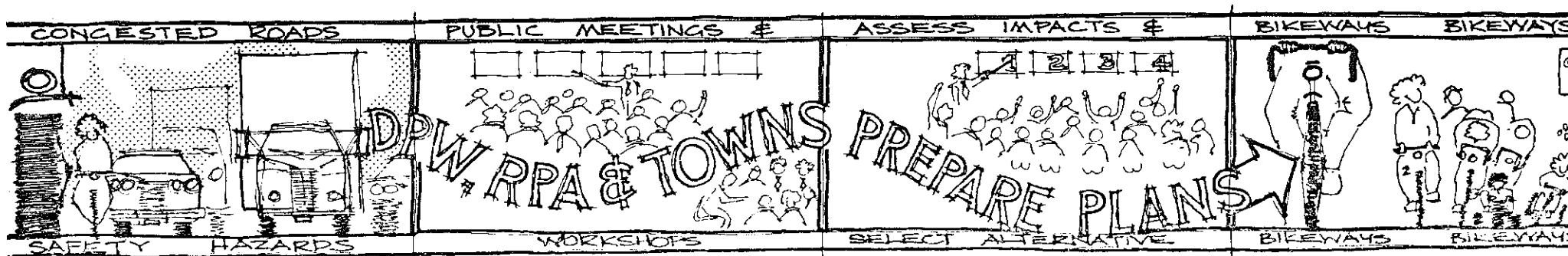
You and the members of your household are being asked to answer this questionnaire about the ways in which you use your bicycles. The information that the town of _____ gathers from this survey will be used to determine where and what kind of bicycle facilities should be provided for the town. The number of people responding to this questionnaire will also help determine whether the federal or state government will help pay the cost of any planned facilities.

It is therefore very important that you and the other members of your household answer this questionnaire as quickly as possible and return it to a collection bin at one of the following locations:

Or mail it to the following address before

Only answer one of the questionnaires per household.

Thank you for your cooperation.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

BIKEWAY QUESTIONNAIRE

ZIP CODE _____

1. How many persons live in this household? _____

2. How many automobiles are registered to your household? _____

3. How many members and what are the ages of bicycle users in your household?
(Indicate number of users in each age group)

5-11 Yrs. _____ 12-18 Yrs. _____ 19-25 Yrs. _____

26-35 Yrs. _____ 36-49 Yrs. _____ Over 50 Yrs. _____

In the next section of the questionnaire, please indicate your answers by entering the number of persons in each category.

4. How often and for what purpose do members of your household use their bicycle(s)?

(Please check the appropriate column:

DA = Daily, WK = Weekly, OC = Occasionally,

NA = Not Applicable.)

TRIP PURPOSE	DA	WK	OC	NA
RECREATION Park - Sports				
COMMUTER Work - School				
NON-RECREATIONAL Shopping - Visiting				

5. If safe bikeway facilities were provided, how often and for what purposes would the members of your household use their bicycle(s)?

TRIP PURPOSE	DAILY	WEEKLY	OCCASIONALLY	NOT APPLICABLE	TOTAL
RECREATION Parks - Sports					
COMMUTER Work - School					
NON-RECREATIONAL Shopping - Visiting					

6. Do you think that bicycle facilities in your locality provide adequately for the needs of the cyclist? YES NO

7. In which of the following ways do you think bicycling facilities could be improved?

- Providing bicycle parking racks in heavily used areas.
- Safety education for bicyclist and automobile drivers.
- Providing areas reserved exclusively for bicycles on roadways (Bikelanes).
- Providing bicycle paths completely separated from roadway (Bikepaths).
- Marking routes along roads for bicyclists to follow, no separation from cars.
- Other (Please specify).

8. What discourages you most from using your bicycle?

- ☐ Drivers don't respect the bicyclist's right to the road.
- ☐ Cars travel too fast along the roads on which I would like to ride.
- ☐ There are too many potholes in the roads.
- ☐ Too much sand, glass and other debris on the road.
- ☐ Bicycle too easy to steal.
- ☐ Other (Please specify).

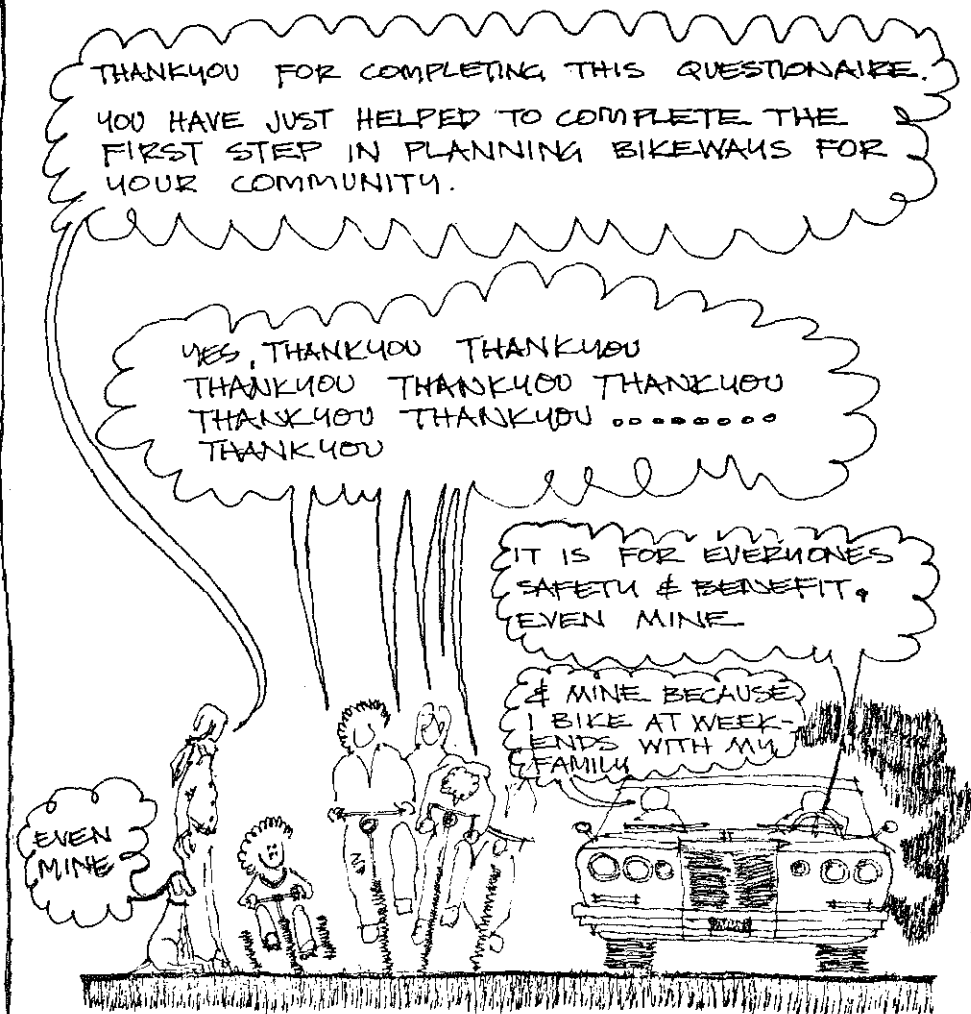
9. When you ride your bicycle along roads that have heavy automobile traffic, which of the following are important reasons for doing so?

- ☐ Fewer stop signs.
- ☐ Less cross traffic.
- ☐ Shorter distance.
- ☐ Fewer hills.
- ☐ Better road surface.
- ☐ More attractive scenery.
- ☐ The only way to get which I am going.
- ☐ Other (Please specify).

10. Have you or other members of your household ever been involved in bicycle/auto accident? If so, please indicate the following.

_____ Injured _____ Number of members involved in bike/auto accidents

11. Where, if the choice were yours, would you like to ride your bike within your community? (Street Names)

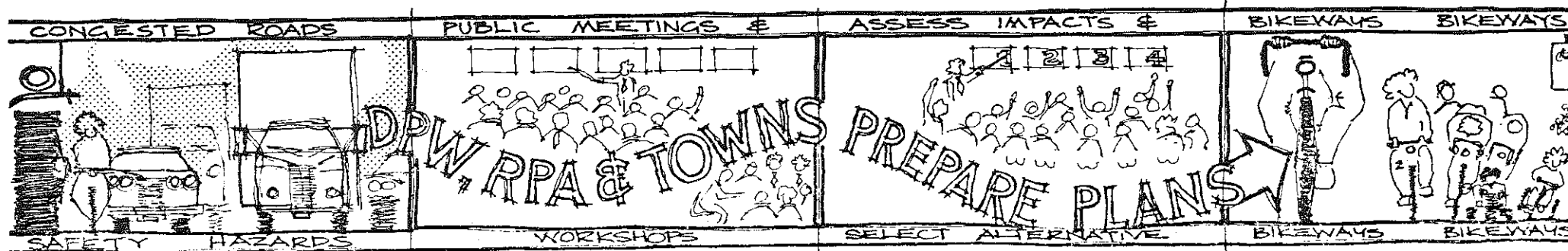


DRIVE & BIKE CAREFULLY.

BIKEWAYS QUESTIONNAIRE

= SCHOOLS =

The government in your town wants to make it safer for people to ride their bicycles. In order to do this, they need to find out more about where people go on bicycles and what kinds of things make them feel unsafe when they ride. You can help your town by carefully answering the questions on this survey that apply to you.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

1. What is the name of your school? _____

2. What grade are you in? _____

3. How old are you? _____

4. How many miles from school do you live?

- a. Less than one _____
- b. one to two _____
- c. two to four _____
- d. More than four _____

5. Do you have a bicycle? Yes _____ No _____

6. How do you usually get to school in the morning?

- a. I walk _____
- b. I take the bus _____
- c. I ride my bicycle _____
- d. Travel by car _____

ANSWER THESE QUESTIONS ONLY IF YOU HAVE A BICYCLE.
IF YOU DON'T HAVE A BICYCLE, GIVE THIS FORM BACK
TO YOUR TEACHER.

7. How often do you use your bicycle (Check one)?

- a. Every day _____
- b. A couple times a week _____
- c. Less than once a week _____

8. How often do you use your bicycle to get to the following places? (Please check the appropriate column, DA = Daily, TW = two - three times per week, OC = Occasionally, RA = Rarely.)

	DA	TW	OC	RA
To School				
To Work				
To Town				
To Local Shops				
To Shopping Centers				
To Libraries				
To Ball Fields, Swimming Pools Tennis Courts and Other Sporting Facilities				
To Movies				
To Parks				

9. In addition to riding your bicycle for the above reasons, how often do you ride your bicycle for any of the following reasons?

	DA	TW	OC	RA
For Pleasure				
For Exercise				
For Touring				
For Sightseeing (Scenic and Historic Sites)				

10. If safe bikeways were provided, how often would you use your bike to get to the following places?

	DA	TW	OC	RA
To School				
To Work				
To Town				
To Local Shops				
To Shopping Centers				

KEEP GOING YOU
ARE $\frac{1}{2}$ WAY THERE
(WELL NEARLY $\frac{1}{2}$ WAY, THERE ARE ONLY 18 QUESTIONS)

	DA	TW	OC	RA
To Libraries				
To Ball Fields, Swimming Pools Tennis Courts and Other Sporting Facilities				
To Movies				
To Parks				

11. If safe bikeways were provided, how often would you use your bicycle for the following reasons?

	DA	TW	OC	RA
For Pleasure				
For Exercise				
For Touring				
For Sightseeing (Scenic and Historic Sites)				

12. If you do ride your bicycle to school, how safe do you feel doing it?

- a. Very safe _____
- b. Safe _____
- c. Not too safe _____
- d. Very unsafe _____

13. What scares you most when you ride your bicycle?
(Check two things)

- a. Cars speeding by _____
- b. Riding on busy streets _____
- c. Crossing busy streets _____
- d. Holes in the road _____
- e. Sand, glass or other trash
on the roadway _____
- f. Something else? (Please explain) _____

14. If you do not ride your bicycle to school, which of the following are the two most important reasons why you don't?

- a. Too far to ride _____
- b. Parents don't let me _____
- c. Afraid of getting bicycle
stolen _____
- d. No place to park bikes _____
- e. Too many hills to climb _____
- f. Too many things to carry _____
- g. It's easier to get to school
another way _____
- h. There is no safe way for me to
get to school on a bike _____

15. Would you ride a bicycle to school on nice days if they made it safer for bicyclists to get there?

Yes _____ No _____

16. Have you ever ridden on a bicycle path made for bicycles only?

Yes _____ No _____

17. Would you like to see bicycle paths built for people in your neighborhood?

Yes _____ No _____

18. What do you think would be the best thing that the government could do to make it safer for bicyclists? _____

ROAD USER SURVEY

1. Cyclist stopped on _____ Street
heading _____ (N, S, W, E).

2. Day & Date _____

3. Time _____

4. Cyclist's Age _____ 5. Sex _____

6. Where are you going:

_____ To school	_____ To library
_____ To work	_____ To the movies
_____ To local shops	_____ To the park
_____ To shopping center	_____ To the ballfield, swimming pool, tennis courts or other sporting facility
_____ Other (specify)	

7. If you are not riding to anyplace in particular which of the following reasons are you riding for:

_____ pleasure
_____ exercise
_____ touring
_____ sightseeing (scenic & historic sites)

8. How frequently do you use this route for bicycling:

_____ Daily _____ Biweekly _____ Occasionally
_____ Rarely

9. Where will you park your bicycle when you reach your destination:

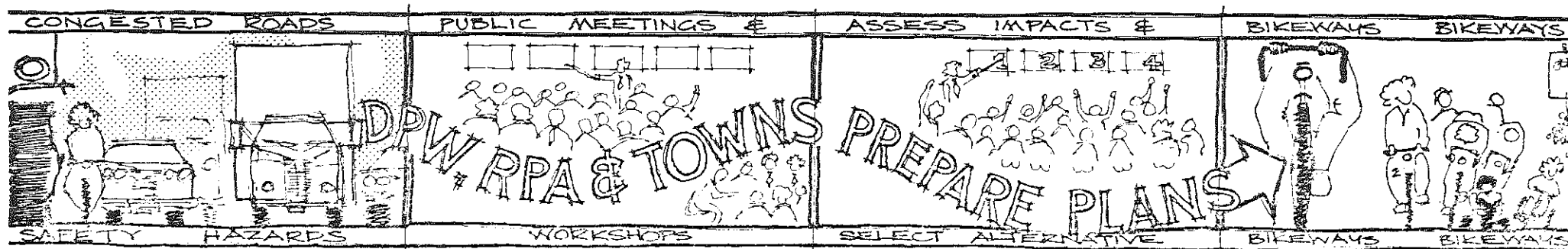
10. Do you feel safe riding your bicycle along this road? _____ Yes _____ No

11. What can be done to improve cycling in your area?

APPENDIX

Included in this appendix are the UMASS/DPW Bikeways Planning Publications:

1. Bikeways: Definitions
2. The DPW Bikeways Planning Process
3. Bikeways: Funding
4. Bikeways: Design Standards
5. Bikeways: Demand Determination

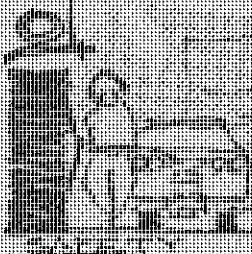
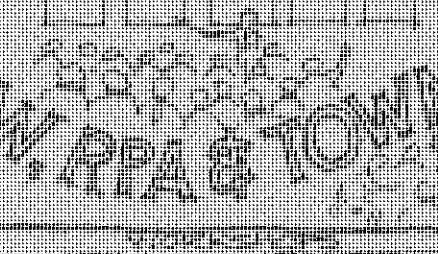
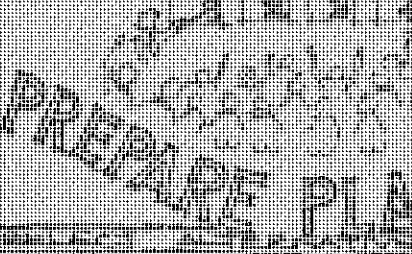
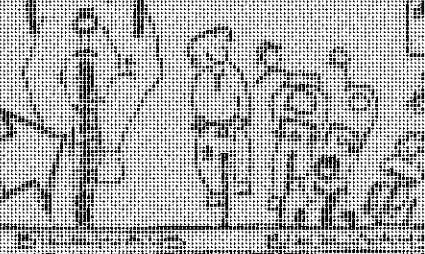


MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

E

BIKEWAYS: DEFINITIONS

CONGESTED ROADS	PUBLIC MEETINGS &	ASSESS IMPACTS &	DEVELOP BIKeways
			

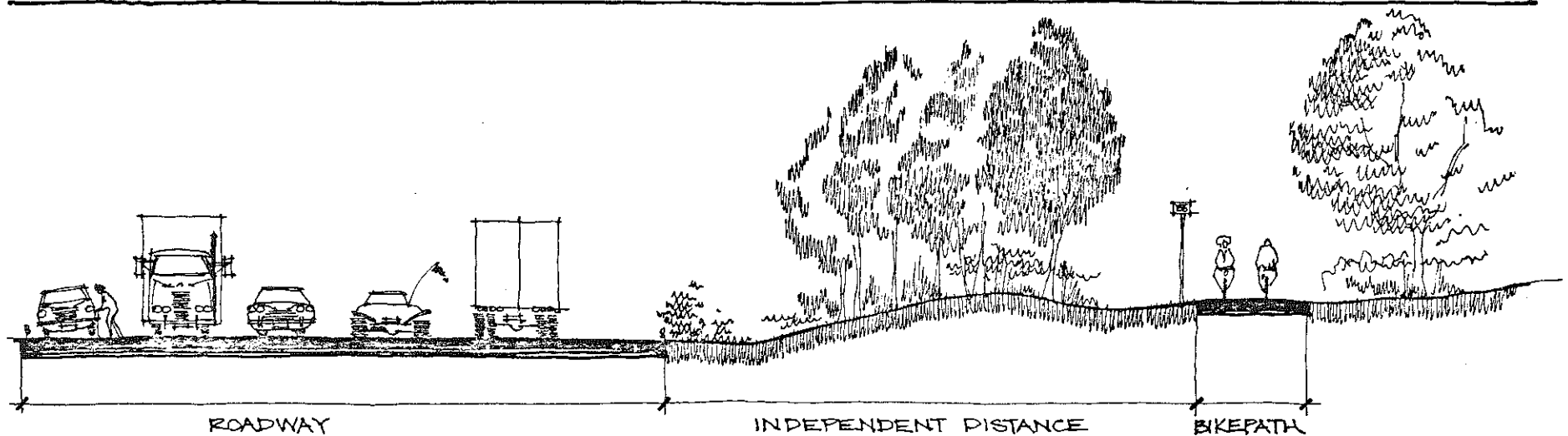
DEFINITIONS

The following definitions and additional material are intended to develop a broader understanding of the potential limitations and requirements inherent in various types of bicycle facilities.

Although the definitions are to some extent exclusive in that they refer primarily to bicycle and pedestrian facilities, they are only intended to provide planners with a common terminology for classifying facilities. The DPW encourages investigations of compatible multiple uses of bikeways.

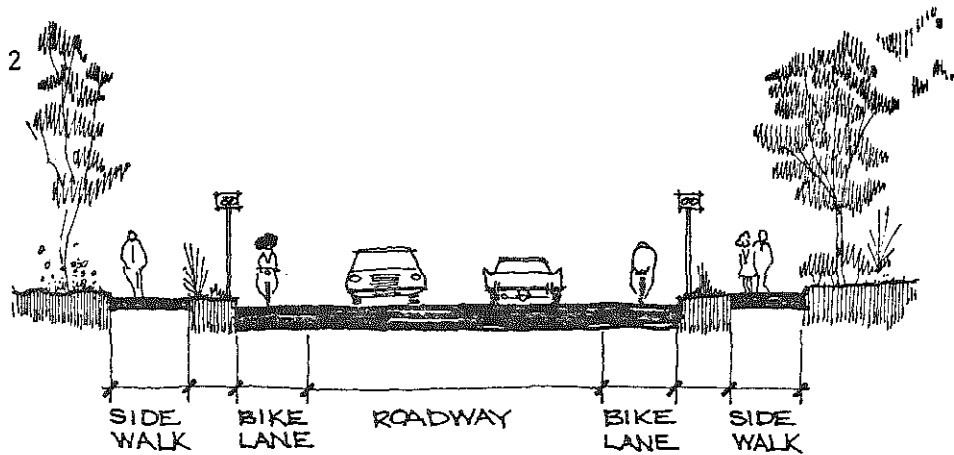
bikeway

BIKEWAY IS A GENERAL TERM DESCRIBING ANY FACILITY RESERVED EXCLUSIVELY OR PREFERENTIALLY FOR BICYCLE TRAVEL OR A SHARED FACILITY WHICH ALLOWS SAFE AND COMFORTABLE BICYCLE TRAVEL.

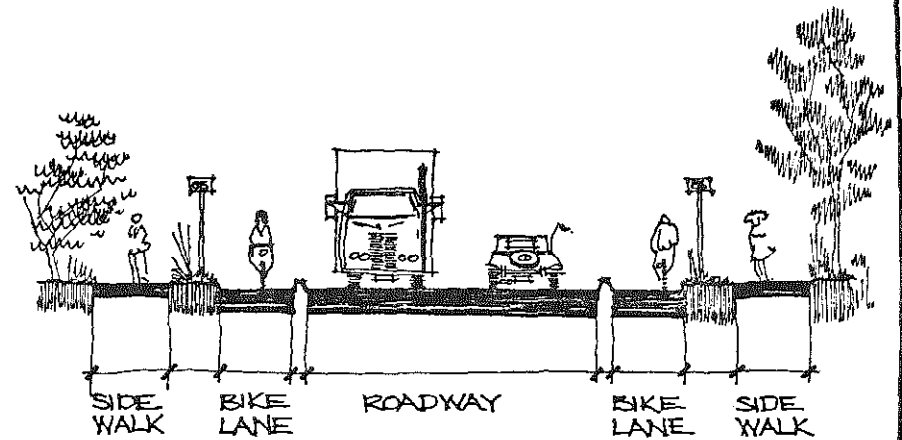


bikepath (PREVIOUSLY CALLED A "CLASS I")

BIKEPATH IS A COMPLETELY SEPARATE TRAVEL WAY FOR THE EXCLUSIVE USE OF BICYCLES. They may be either within an existing right of way or on a completely new right of way.



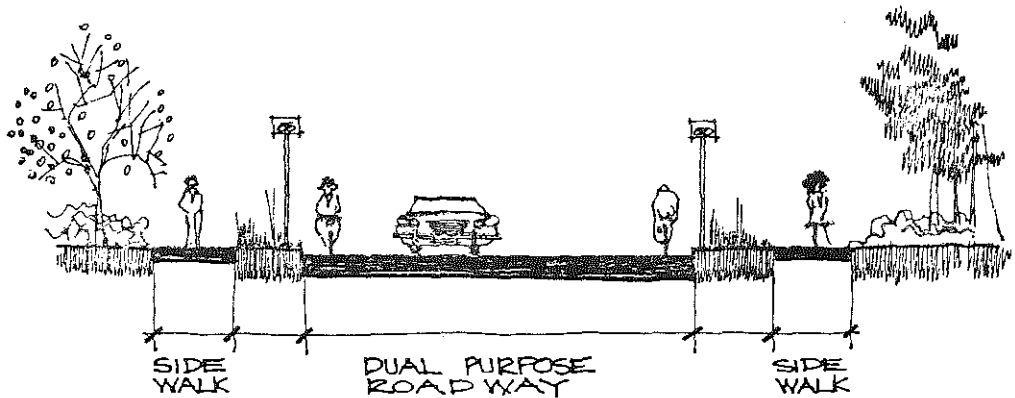
UNPROTECTED BIKELANE



PROTECTED BIKELANE

BIKELANE IS A PORTION OF THE ROADWAY SET ASIDE FOR EXCLUSIVE BICYCLE USE, DELINEATED BY VISUAL OR PHYSICAL BARRIERS. They may be either indicated by a painted line or change of material, outside or inside a row of parked cars, or separated from automobile lanes by a physical barrier.

(PREVIOUSLY CALLED A "CLASS II") bikeline

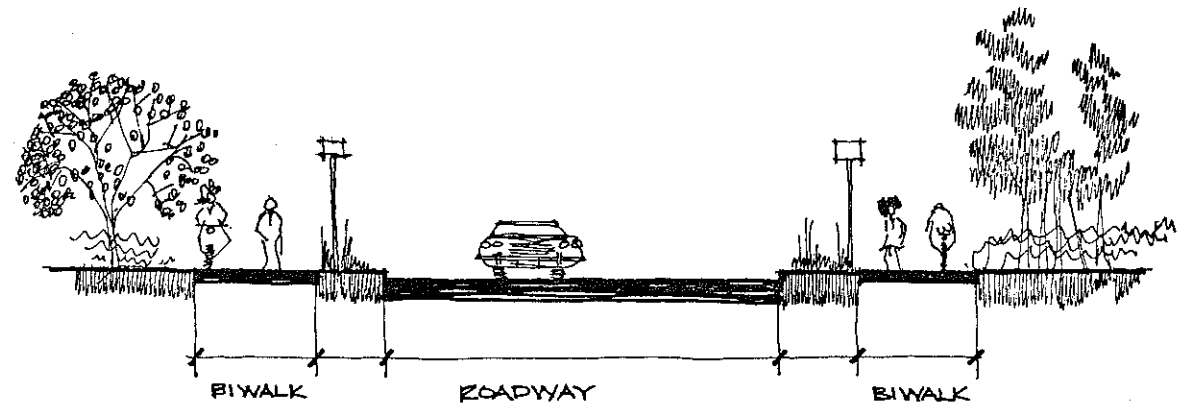


BIKEROUTE IS A TRAVEL WAY SHARED WITH AUTOMOBILES WHICH IS APPROPRIATELY CONSTRUCTED, MAINTAINED AND SIGNED FOR THE CON-
VENIENCE AND SAFETY OF ALL USERS. They are roads of low intensity use which are suitable for multipurpose use.

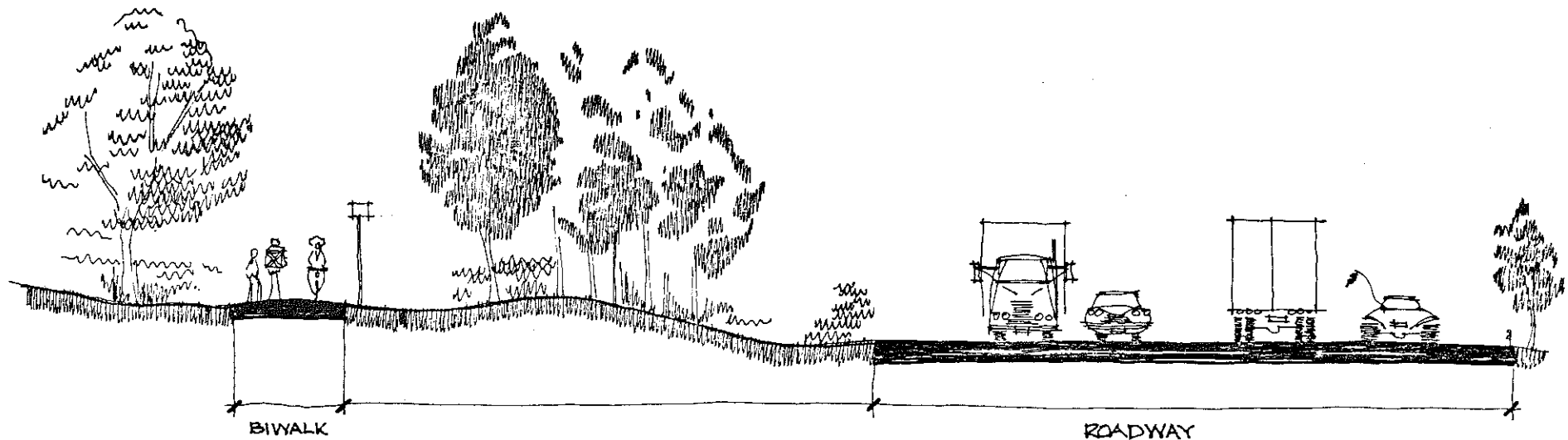
(PREVIOUSLY CALLED A "CLASS III") bikeroute

biwalk

BIWALK IS A TRAVEL WAY SHARED BETWEEN CYCLISTS AND PEDESTRIANS WHICH IS APPROPRIATELY CONSTRUCTED, MAINTAINED AND SIGNED FOR THE CONVENIENCE AND SAFETY OF ALL USERS. They may be existing sidewalks that are converted for multiple use or separated paths built specifically for the purpose.



BIWALK - CONVERTED SIDEWALK



BIWALK - SEPARATED PATH

IMPLICATIONS OF DEFINITIONS

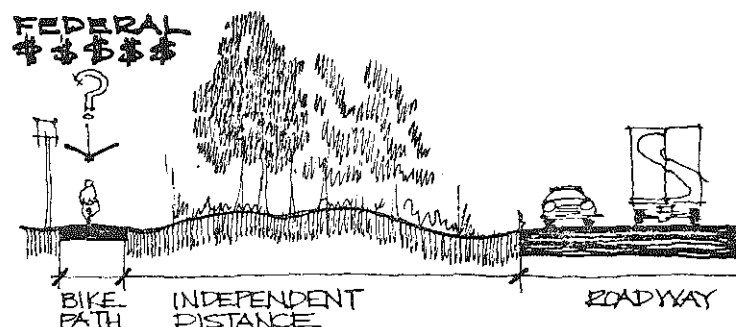
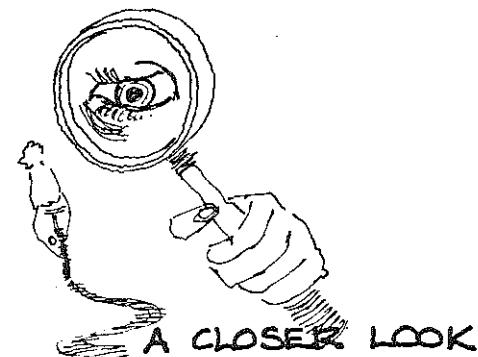
Although the primary consideration in bikeway construction has been cost and the safety of roadway users, other factors can significantly affect the way we view a proposal for a bikeway. The purpose of this section is to introduce some of these elements and suggest why they are relevant considerations. The intention is not to present any final judgements, but merely to generate ideas which will lead to a broader understanding of the constraints and opportunities inherent in the various types of bikeways.

BIKEPATHS

Recent changes in the U.S. Department of Transportation regulations provide that in certain circumstances, Federal Highway Trust Funds can be spent to purchase separate rights of way for bikeways. This relaxation of regulations broadens considerably the potential routes which a bikepath can follow and still receive federal funding under Section 124 of the Federal Aid Highway Act of 1973 (see: Federal Aid Highway Programming Manual: Transmittal 18, March 8, 1974).

As a result, possible federally funded routes for bikepaths may include not only existing highway rights of way, but also electrical and other utilities rights of way, areas adjacent to waterways (e.g., canals), abandoned railroad right of ways, and other purchased rights of ways.

In urban areas, bikepath construction can be undertaken as part of a broadscale effort to upgrade areas of the city or town in need of beautification. (An extremely exciting proposal of this sort is now being considered for Wichita, Kansas.) These areas could include riverfronts or blighted areas. The result of this sort of project can be not only an improvement for bicyclists, but also a change for the better in the overall city environment. Other potential areas for bikepath development include recreation areas, parks, and conservation areas.

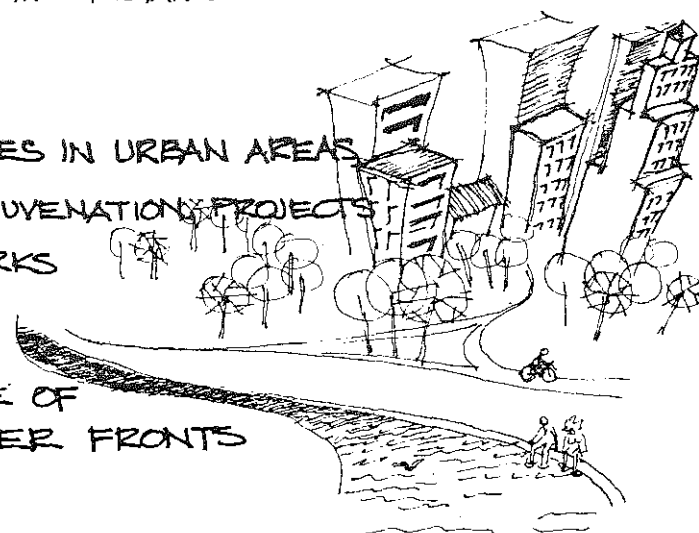


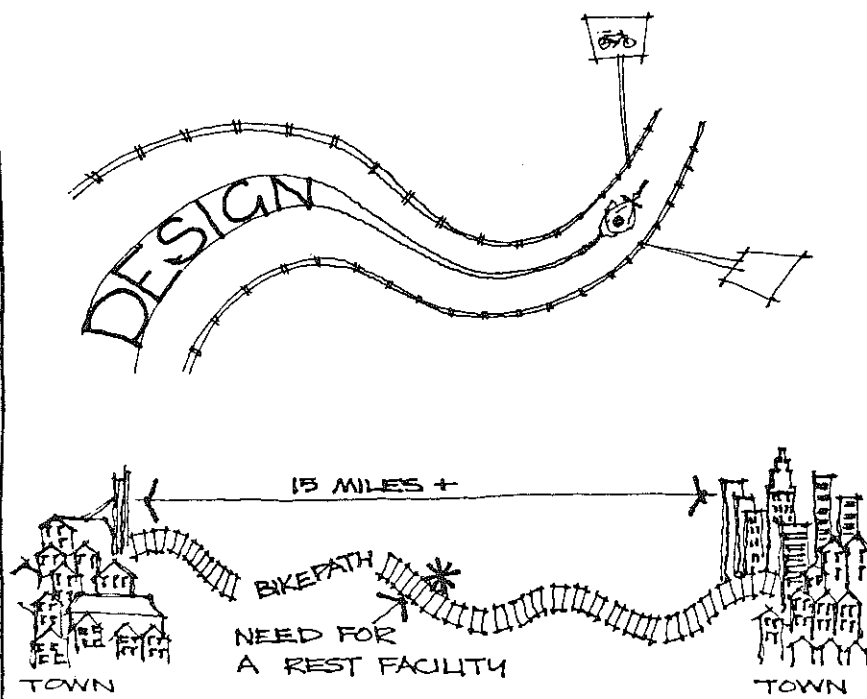
BIKES IN URBAN AREAS

RENUVENATION PROJECTS

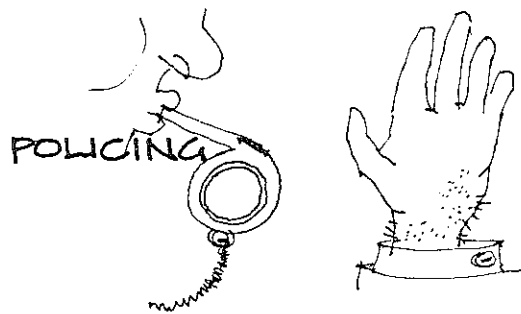
PARKS

USE OF RIVER FRONTS





REGULAR MAINTENANCE



SAFETY

HEALTH

Design considerations of bikepaths will be geared exclusively to bicycle users. Thus, grades, radii of curves and construction requirements will reflect the special non-motorized and slower character of bicycle travel. Also important are directional and cautionary signs, appropriate (properly scaled) lighting and the overall aesthetic qualities of the alignment. Grade crossings of bikepaths and roadways must be designed to insure adequate sight lines for both auto drivers and cyclists. This may include banning automobile parking in areas where sight lines would be interrupted.

In non-urban areas, bikepath planning must consider the cyclists need for rest facilities. Unless the route links nearby towns, special facilities will have to be provided.

In planning bikepaths, careful consideration of possible natural limitations will need to be undertaken since realization of the plan will require extensive groundbreaking and construction.

Another consideration in bikepath construction will be maintenance responsibility. This activity will require more thoroughness than it does on highways. To a bicyclist, even small potholes in the roadway and minor debris cause inconvenience and potential danger. Plans must include provision for frequent mechanical sweeping.

An unfortunate reality of our time is the need for extensive policing of public areas. Bikepaths will be no exception. A possible solution would be to equip the policeman assigned to the area with a bicycle or motor scooter.

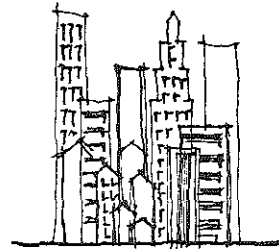
Specific Advantages of Bikepaths

1. Provides the most safety against accidents with motorized vehicles.
2. Makes possible sufficient separation of bicyclists from existing roadways. This mitigates health hazards resulting from concentrations of exhaust fumes and diminishes apparent road noise levels.

3. If properly designed, a separated path will be more appealing than other types of facilities. Although they may be more costly in the short run, over the long run higher usage levels will justify these added costs.

Limitations to Bikepath Development

1. In areas of intensive land use (e.g., centers of cities) there may be inadequate space for siting of completely separated bicycle facilities.
2. The initial cost of a bikepath is often higher than initial costs of other bicycle facilities. (As has been pointed out, increased usage could offset these higher initial costs.)



JUSTIFIES COST

INADEQUATE SPACE
IN URBAN AREAS

MORE \$

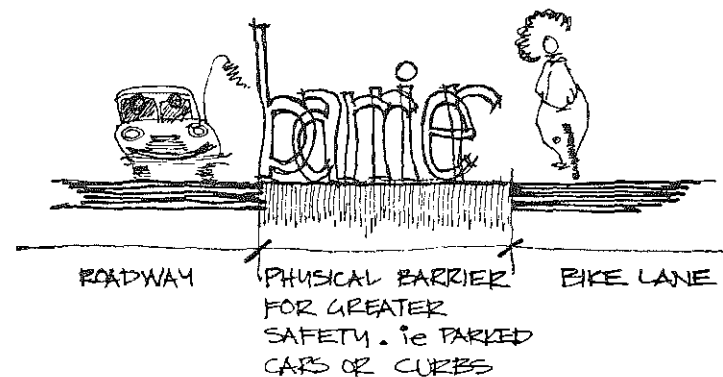
BIKELANE

Separate lanes exclusively for use by cyclists created on existing roadways can significantly increase the safety of cycling. These are appropriate where land is scarce but significant bicycle use exists.

For greatest cyclist safety, a physical barrier between the lane and auto roadway should exist. This can easily be done by placing the parking lane between traffic and cyclists. Other solutions include use of planting boxes, curbs, parking lot bumper blocks, or other types of raised barriers. Simple lane stripes can also be appropriate. By altering parking regulations on a street and moving the center line of the road, it is often possible to create enough free space to accommodate a bikelane. There are a number of other acceptable possibilities. Although bikelanes will separate bicycles from parallel traffic, at intersections, hazards from turning vehicles and cross traffic exist. Cautionary signs and unobstructed sight lines are required for motorists', as well as cyclists', safety. The safest intersections for bikelanes are those with traffic signals.

Recent studies show that even along bikelanes where there is no physical barrier, traffic moves faster and more smoothly than on bikeroutes. The presence of a lane stripe appears to make

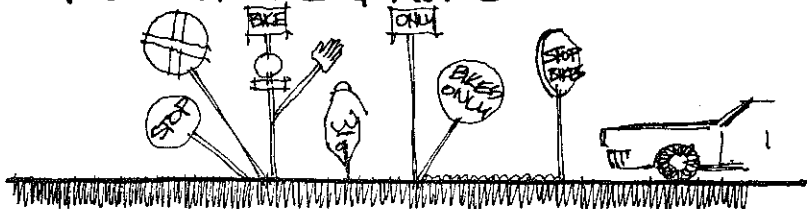
SEPARATE BIKELANES



BARRIER FOR SAFETY

TRAFFIC MOVES FASTER ON ROADS
WITH BIKELANES THAN ON BIKEROUTES

SIGNS FOR BIKES & AUTOS



automobile drivers more comfortable about being on the same street with bicyclists.

Drivers as well as cyclists must be clearly informed of their responsibilities on a street with bikelanes. This would require informational signs for motorists reading: "BIKELANE - BIKES ONLY".

Specific Advantages of Bikelanes

1. Provides for separation of autos and bicycles in areas where spatial constraints exist.
2. Lower construction costs than for a separated path.
3. Allows for safe bicycle access to intensively used central city streets and areas.
4. Easier to maintain and police than separated paths.
5. Generally use existing rights of ways.

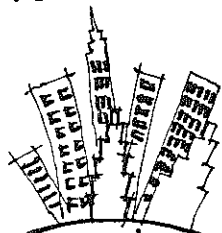
Specific Disadvantages of Bikelanes

1. On narrower streets, parking may need to be prohibited on one or both sides of the street to accommodate a bikelane,
2. Confusion regarding parking regulations or their disregard could cause blockage of a bikelane.
3. Use of two way lanes would cause a safety hazard at the end of a route and at intersections where drivers would not expect bicycles approaching from the right.
4. Riding on bikelanes, cyclists are exposed to air pollution and noise of automobiles and other vehicles. Recent studies show that exposure to high levels of pollutants while exercising is potentially extremely harmful (AIP Journal - March 1974).

RELATIVELY SAFE

LESS \$

SUITABLE FOR
URBAN AREAS



EASIER TO MAINTAIN & POLICE

USE EXISTING R.O.W.

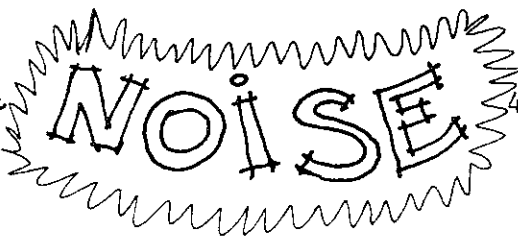
MAY EFFECT PARKING.



POSSIBLE CONFUSION

TWO-WAY LANES UNADVISABLE

AIR POLLUTION &



5. A thorough drivers' and cyclists' education program is necessary to avoid confusion and ensure the proper use of bikelanes.



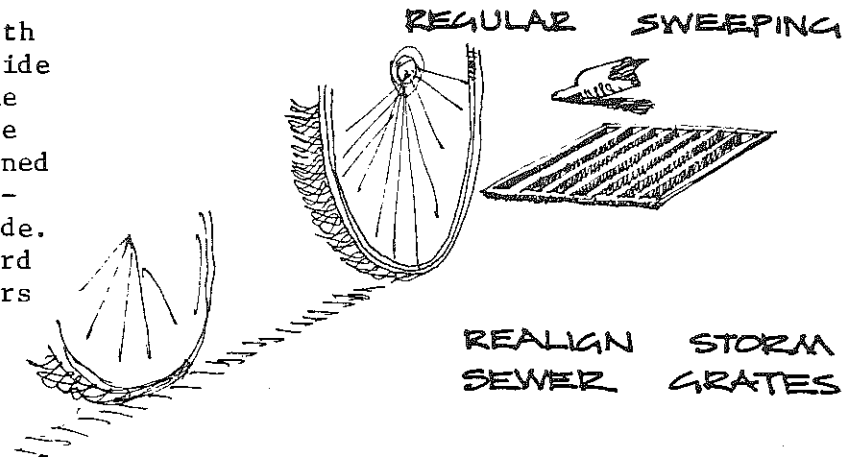
SAFETY EDUCATION
PROGRAM NEEDED

BIKEROUTES

Although the marking of bikeroutes is a fairly popular way of attempting to provide for the safety and convenience of cyclists, the usefulness of this approach is limited and indeed can often produce less than desirable results. However, when properly planned, a signed "bikeroute" can improve rider safety.

BIKEROUTES CAN IMPROVE SAFETY

On a shared route, cyclists will travel near the curb-side with no barrier between motor vehicles and bicycles. Since curb-side areas generally accumulate rubbish and hazardous material, the signed route must be swept frequently so that cyclists will be able to safely ride close to the curb. Roadways that are signed as "bikeroutes" must also be carefully maintained. During re-surfacing, storm sewers must be raised to the new roadway grade. (The popular practice of sloping the new roadway surface toward sewers is dangerous to cyclists.) The gratings on storm sewers should be so aligned as to enable cyclists to ride over them safely.



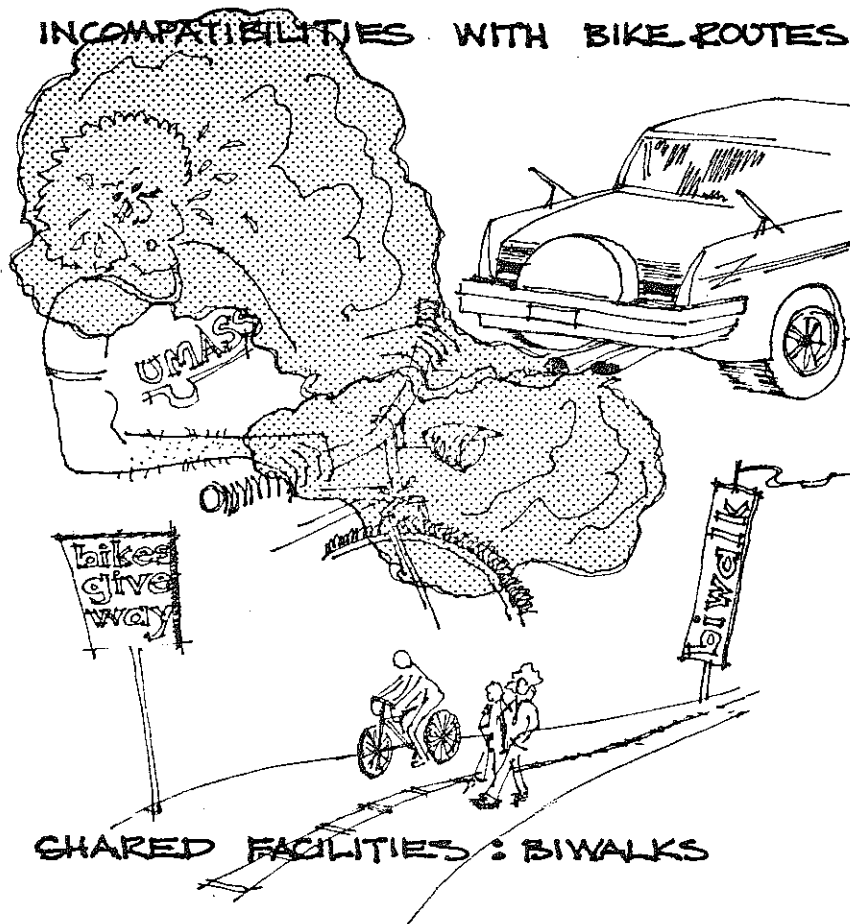
Cross streets should be marked to caution drivers that they are approaching a "Bikeway Crossing". Considerable safety advantages would accrue if the following traffic regulations were enforced:

1. Requiring cyclists to ride in single file only.
2. Prohibiting stopping at curbside by autos except in emergencies.
3. Requiring autos to yield to cyclists when making right turns.

These and other responsibilities of cyclists and drivers should be made clear through an education program in the community. Paying careful attention to the details outlined above can make

SAFETY EDUCATION PROGRAM

INCOMPATIBILITIES WITH BIKE ROUTES



SHARED FACILITIES : BIWALKS

BIWALKS ON SEPARATED PATHS

signed routes a significant safety improvement for cyclists rather than merely providing a false sense of security as is often the case.

Although bikeroutes can be used as an inexpensive way of re-directing bicycles away from congested city streets, research shows that few cyclists are willing to travel out of their way for such a limited gain. As a result, expenditures for this type of route may not be worthwhile.

In any case, the inherent problems arising from the juxtaposition of incompatible means of transit are none-the-less most strongly experienced in a bike-route situation. The hazards resulting from wind drafts of passing vehicles, blowing road dust, air and noise pollution can make a bike-route quite inconvenient and unpleasant.

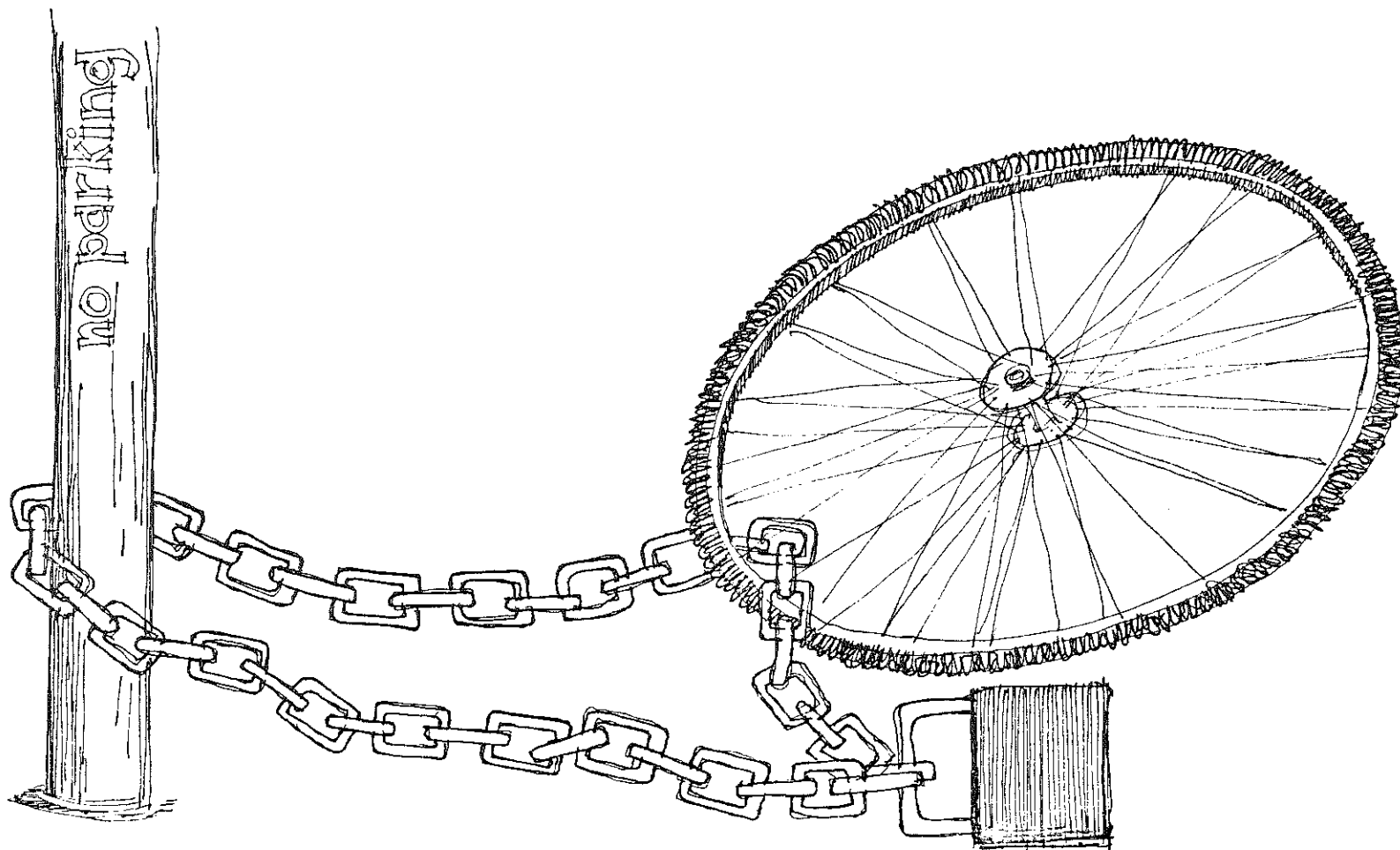
BI-WALK

Shared pedestrian/bicyclist facilities have become popular in some parts of Massachusetts. This is an appropriate solution in areas where there is heavy high speed roadway traffic or limited pedestrian or bicycle traffic. In order to be safe for both cyclists and pedestrians, the bi-walk must be of sufficient width with a visual barrier between pedestrian and cyclists zones. Curb cuts at cross streets are required. Signs should indicate the potential presence of both cyclists and pedestrians and also inform cyclists that they must yield to pedestrians. Cross streets should be properly signed to caution drivers that they are approaching a "Bicycle (or Bike-Way) Crossing".

The possibility of biwalks on completely separated rights of ways should be considered. In this case, maintenance and policing considerations will be similar to those existing on bikepaths.

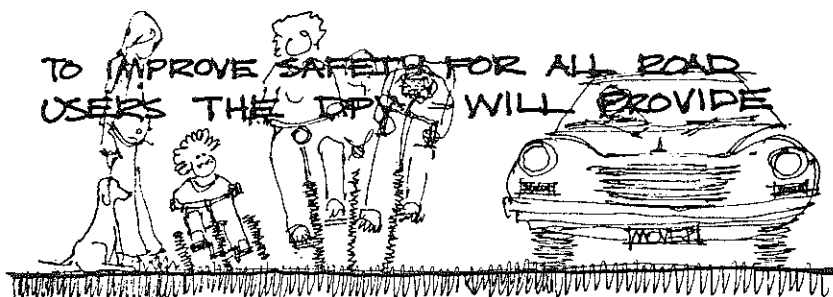
PARKING AND SECURITY

Since provisions of any type of bicycle facility will increase cycling in the area, local governments, school boards, and private groups (e.g., Chambers of Commerce or individual merchants), should be encouraged to provide parking and locking facilities in appropriate areas. These would include schools along the route, shopping areas, tourist attractions, as well as bus and train stations where large numbers of people may switch from bicycles to another means of transport.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
HIGHWAYS PLANNING INFORMATION APRIL 1982

TO IMPROVE SAFETY FOR ALL ROAD
USERS THE DPW WILL PROVIDE



PLANNING ASSISTANCE

COORDINATE WITH OTHER STATE
AGENCIES

LOCATE & DESIGN BIKEWAYS

USE EXISTING RIGHTS OF WAY

ACQUIRE PROPERTY

CONSTRUCT BIKEWAYS

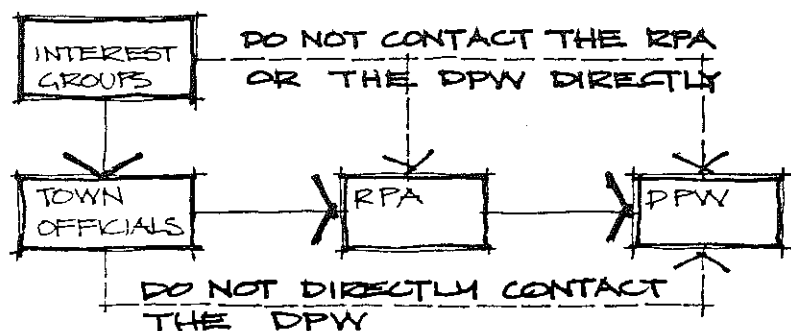
PROVIDE RELATED FACILITIES

ASSISTANCE AVAILABLE FROM THE MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

In order to promote a balanced transportation system in Massachusetts, to improve the safety for all road users, and to serve the increasing number of cyclists, the Department will:

1. In collaboration with the Regional Planning Agencies, work with local officials and citizen groups in planning bikeway systems by including regional/local bikeway plans in regional priorities.
2. Coordinate plans with other state agencies.
3. Locate and design highway-related bikeways and related facilities.
4. Use, as appropriate, existing state or federal-aid highway rights-of-way for bikeways.
5. Acquire property for bikeways in conjunction with state or federal-aid highways.
6. Construct highway-related bikeways and/or provide appropriate signing.
7. Provide related facilities to enhance motorists/bicyclists safety and enjoyment.

All requests for any of the above assistance should be directed to the regional planning agencies rather than directly to the DPW. The RPA's are responsible for comprehensive planning on a regional level and they will provide initial planning assistance and advice.



NOTE: Highway-related does not necessarily mean within an existing or proposed right-of-way, as in certain circumstances, Federal Highway Trust Funds can be spent to purchase separate rights-of-way for bikeways. (See: Federal Aid Highway Programming Manual: Transmittal 13, March 8, 1974 (Appendix A).)

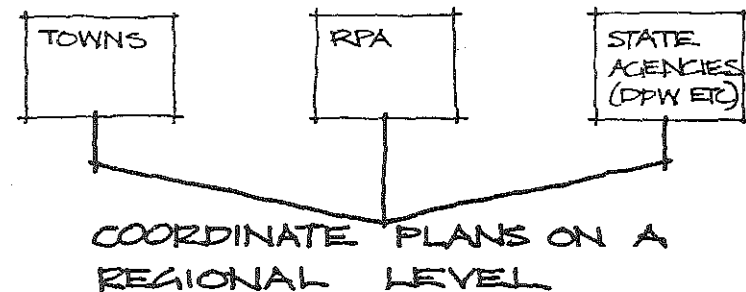
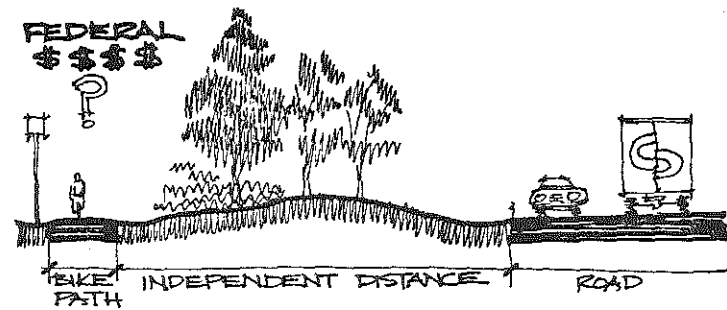
THE BIKEWAYS PLANNING PROCESS

The planning process is very simple and is aimed at using the resources of the towns, regional planning agencies, and state agencies in an efficient way and avoiding duplication of effort by coordinating plans on a regional level. Basically, its purpose is to assist towns in preparing and implementing bikeway plans, and to ensure compliance with planning requirements and laws which apply when federal and/or state funding is involved.

It is not mandatory that a town comply with the process described in the following pages. Some towns may choose to develop their bikeways using local resources only. However, if it is likely that state or federal aid will be requested, complying with the process will insure that all requirements are met. The process described assumes that little planning work has been done. If, however, reasonable plans have been developed based upon adequate demand studies and an effective planning approach, then there may be certain steps that can be modified or even eliminated.

The procedure is as follows:

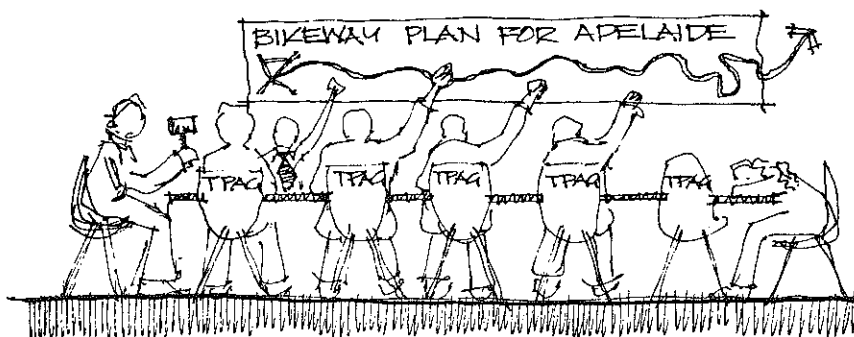
1. Towns interested in developing bikeways systems should contact their regional planning agency for assistance and guidance. (Community groups interested in bikeways should channel their efforts through town officials.)
2. On request, the RPA will provide basic planning and design information and assist the towns wherever possible in providing adequate data to enable the Transportation



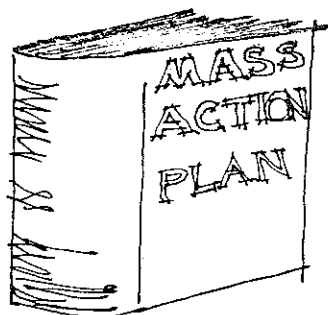
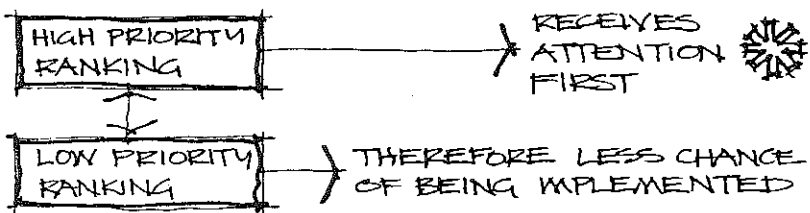
PLANNING PROCESS COMPLIES WITH
STATE & FEDERAL LAW



RPA PROVIDES PLANNING &
DESIGN INFORMATION



TPAG & RPA ESTABLISH REGIONAL PRIORITIES



Planning Advisory Group (TPAG) to judge the relative merits of a proposal. As all bikeway projects are competing with highway improvement projects for funds, it is important to document proposals in accordance with the RPA's guidelines.

State and federal aid is provided on the basis of regional and state priorities. As the RPA's are responsible for planning within the region, and hence for establishing regional priorities, applications for assistance should be directed through them. Therefore, contacting the RPA's early in the planning process, as suggested above, initiates the procedures for state and federal aid, as well as providing the towns with guidelines for their initial planning work.

3. Towns should submit their projects for inclusion on the regional priority list through their representative to the TPAG.

4. The DPW will provide assistance to transportation projects based upon this priority ranking. A transportation project with a high priority ranking receives attention first and therefore, has a good chance of being implemented. As resources for state projects are limited and will be directed to the transportation projects needed the most, low priority items have less chance of being implemented.

When the DPW becomes involved in a project, it is required to follow the planning process described in the Massachusetts Action Plan. The Action Plan is a document developed in response to Federal Highway Administration requirements whose goals are to ensure that transportation plans are coordinated on a regional level and are responsive to local needs. However, it will take time to completely implement all phases of this plan as it involves complex procedures and years of data gathering, research and planning.

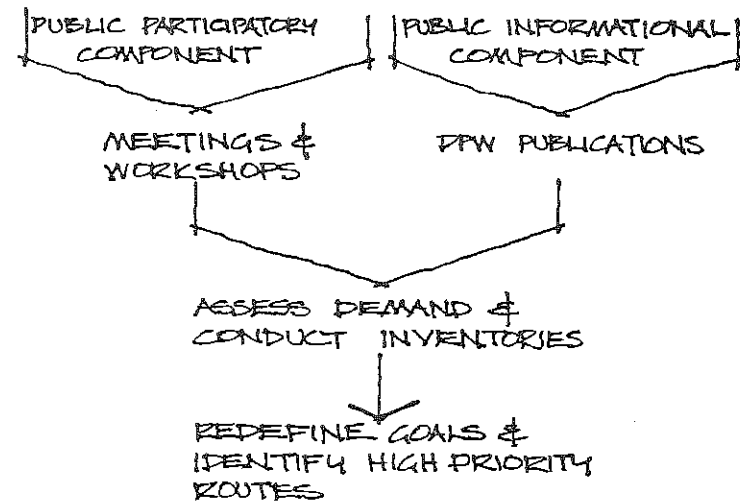
It has therefore been necessary to develop procedures that will enable the Bikeways Planning Process to comply with the Action Plan and still be suitable for planning in the immediate future.

The process to be used involves two phases: Phase I is the interim phase, developed to provide information to supplement the data used to justify the regional transportation priority ranking. On the basis of this information, the DPW will determine the appropriate planning actions for Phase II. When comprehensive regional data have been gathered in the process of developing regional plans, the Phase I information gathering process will become obsolete.

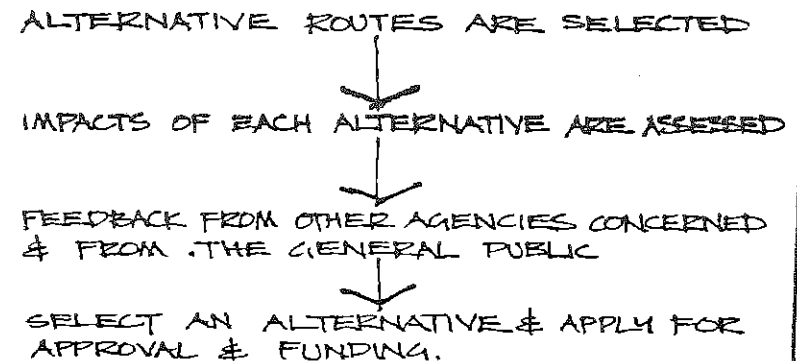
The purpose of Phase II of the process is to explore in detail a number of alternative proposals in terms of the possible advantages and disadvantages to the community in accordance with established procedures for highway impact assessment. As bikeways are anticipated to have little adverse impact on the community, the evaluation procedure is relatively simple.

Basically, the planning process is guided by the DPW, coordinated by the RPA, and involves local officials and interested citizens likely to be effected by the proposal. These groups interact through a series of meetings and workshops. The meetings are generally informational and are aimed at explaining the various phases of the planning process. However, in the workshops, much of the actual work is done; here, methods of gathering information are discussed, specific problems and opportunities are considered, goals are established and the implications of various alternative proposals are analyzed. Therefore, it is important that a reliable task force of citizens is involved to ensure that responsible decisions are made. The task force or Bikeway Advisory Group (BAG) need not be cyclists or have any particular skills, apart from an interest in their community and a desire to improve

BIKEWAYS PLANNING PROCESS PHASE I

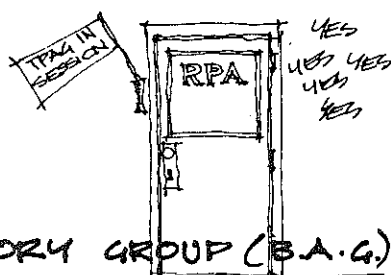


PHASE II





**BIKEWAYS ADVISORY GROUP (B.A.G.)
MUST BE APPROVED BY TPAG & RPA**



it. However, members of the BAG must be representative of the community and be willing to devote time to attend the various meetings and workshops involved. Essentially, they are a subcommittee of the TPAG and therefore must be approved by the TPAG and RPA. Suggestions for the composition of the BAG's are included in this publication.

SUMMARY OF PHASE I OF THE BIKEWAYS PLANNING PROCESS

SUMMARY OF PHASE I

MEETING ONE 1. BIKEWAYS PLANNING
2. DPW PLANNING PROCESS
3. BIKEWAYS ADVISORY GROUP

WORKSHOP ONE 1. DEMAND DETERMINATION
2. INVENTORIES

WORKSHOP TWO 1. REDEFINE GOALS
2. IDENTIFY HIGH PRIORITY ROUTES

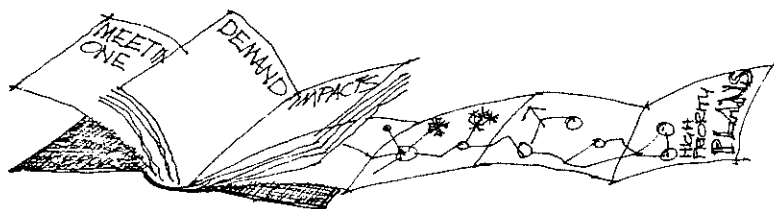
Phase I involves one meeting and two workshops.

1. The purpose of meeting one is to discuss the planning process, the roles of the various groups involved, and the need for and composition of a Citizen advisory group,

2. The purpose of workshop one is to discuss specific methods for determining demand and gathering inventory information.

3. The purpose of workshop two is to establish goals for the region or subregion, discuss specific opportunities and constraints to development, determine the major connections, and add local knowledge to base information generated by the DPW and RPA.

**RPA PREPARES SUMMARY OF PHASE I
"PRELIMINARY BIKEWAY PLANNING REPORT"**



A summary of all the meetings and workshops is prepared by the RPA and is distributed to all participating groups. This report is basically a preliminary planning report with recommendations and investigation of the possible impacts of the proposals. It is called The Preliminary Bikeway Planning Report and includes consideration of:

1. Regional developments and plans, and regional transportation priorities.

2. The possible advantages and disadvantages of the proposals to the community (e.g., improved safety, loss of automobile parking, etc.).
3. The positive and negative environmental impacts.
4. The particular opportunities that exist (e.g., use of an abandoned railway right-of-way, improvement to traffic circulation, etc.).
5. Information generated by demand studies (e.g., traffic counts, accident data, demand questionnaires).

Figure 1 summarizes Phase I of the planning process.

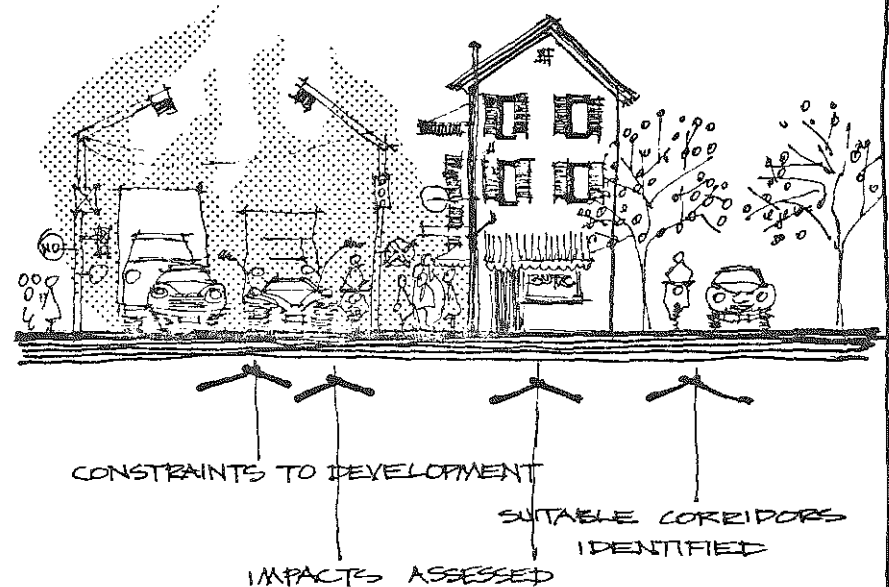
SUMMARY OF PHASE II OF THE BIKEWAYS PLANNING PROCESS

On the basis of the Preliminary Trail and Bikeways Planning Report, the DPW will determine the appropriate actions for Phase II of the process. This phase will vary in accordance with the scope and complexity of the problem; however, it will generally involve two public meetings and one workshop.

1. The purpose of the first meeting is to summarize the findings of Phase I of the planning process and discuss the planning process for Phase II.

Following this meeting, the DPW, with the support of the RPA, synthesizes the information gathered during Phase I of the planning process. Several alternative proposals are developed on the basis of this information.

2. The purpose of the workshop is to discuss these alternative proposals and make appropriate recommendations. The DPW and RPA then produce a second Bikeway Planning Report which is an elaboration of the preliminary report produced at the end of Phase I. In addition, this report documents the synthesis phase of the process, assesses the impacts of

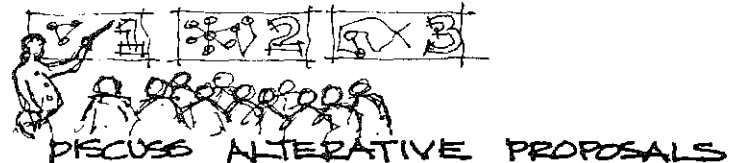


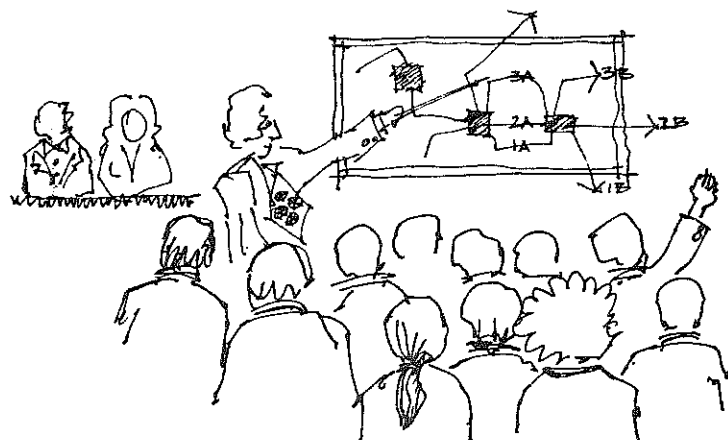
SUMMARY OF PHASE II

FIRST MEETING-REVIEW

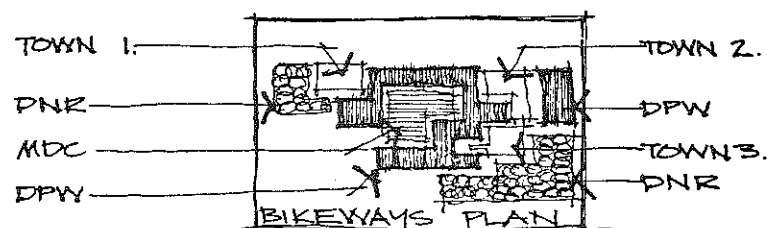


WORKSHOP

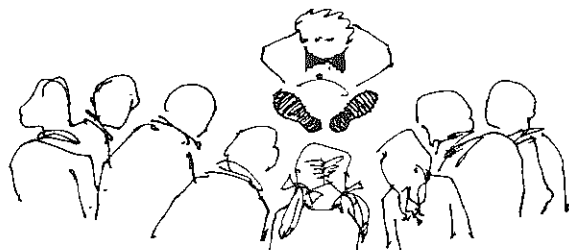




PUBLIC MEETING TO REVIEW ALTERNATIVE PLANS



JURISDICTION DETERMINED



CITIZEN ADVISORY GROUP CALLED BIKEWAYS ADVISORY GROUP (B.A.G.)

the various proposals and includes the proceedings of the workshops and meetings. It is distributed to all groups involved in the process, is made available to the public and is distributed to all reviewing agencies.

3. The purpose of the second meeting is to present the alternative proposals to the general public. The proceedings of this meeting are recorded, reviewed and included in the planning report which is adopted as a Final Bikeways Planning Report. The DPW then submits the report to the appropriate agencies for approval and following this, a proposal is selected.

Once a proposal has been approved, detailed plans, working drawings and cost estimates are prepared. Since all parts of the proposed plan may not be under the same jurisdiction, the DPW may not be responsible for preparing detailed plans for all parts of the system. These questions will have been resolved during the planning phase and the various funding and implementation procedures determined for all parts of the plan. For example, if a section of a proposed route uses land managed by the Department of Natural Resources (e.g., forests, state parks, etc.), consultation during the process will have determined the various agencies responsibilities.

Figure 3 summarizes Phase II of the planning process.

BIKEWAYS ADVISORY GROUP

In an effort to assess the needs and desires of the community and maintain a source of citizen input throughout the planning process, the DPW has developed a mechanism for consulting with local citizens. This is done through citizen advisory groups and by a series of public meetings and workshops which are held at critical points in the planning process as described above.

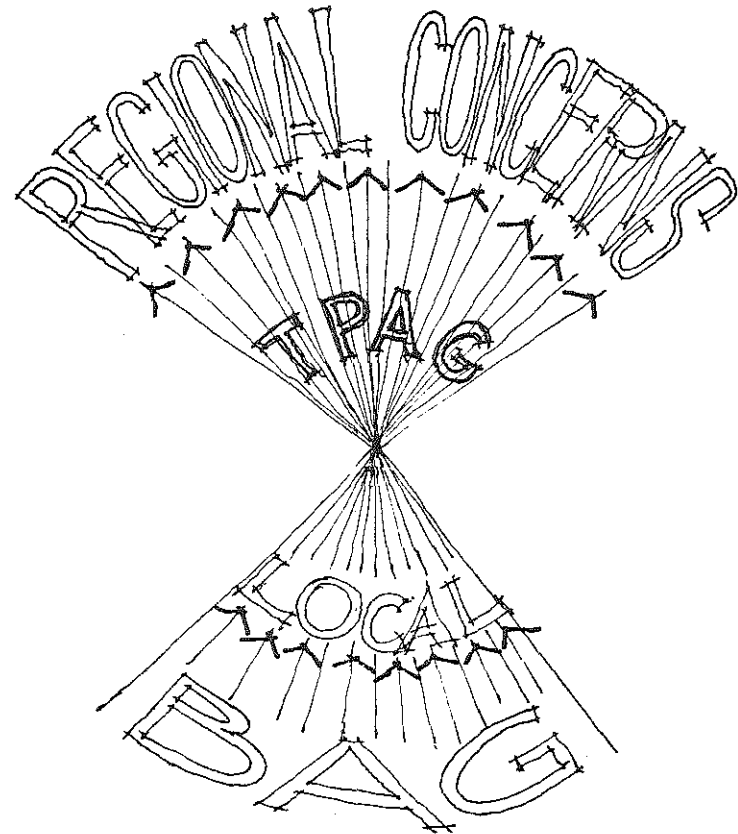
On a regional level, the Transportation Planning Advisory Groups (TPAG's) provide an opportunity for citizens to advise the Regional Planning Agency on transportation-related issues. For Bikeways Planning, advisory groups are organized at the town level and play an active part in the information gathering process. These Bikeway Advisory Groups (BAG) therefore reflect local concerns while the TPAG's are concerned with broader regional issues.

The role of the BAG's in making planning recommendations and gauging public opinion will be explained in more detail as the process unfolds. However, the potential impact of bikeways on all aspects of transportation and recreation in the area, underscores the importance of adequate citizen representation on the Bikeways Advisory Groups. In order to ensure balanced consideration of community needs, representatives of the following groups will be included in the BAG:

At least one town official, selectperson, law enforcement officer, and TPAG member (if the town is represented on the TPAG).

Every effort should also be made to involve members of other identifiable community groups, e.g., educators, merchant associations, park and recreation commissions, chamber of commerce, scouting groups, students, cycling and other recreational clubs, and other interested individuals, particularly those likely to be affected by the proposal.

It is the responsibility of the town officials to encourage members of the community to work in the BAG's. Every effort should be made to contact community leaders and groups, particularly those who may feel that bikeways are not their concern. While newspaper notices and regular town selectmen meetings may be an adequate forum for recruiting members to the BAG in many areas successful results will only be achieved by personally contacting representatives of the above-mentioned groups.



INVOLVE ALL INTERESTED CITIZENS

TOWN OFFICIALS RESPONSIBILITY
TO FORM B.A.G.

✻ GOOD LUCK ✻

SUMMARY: PHASE II BIKEWAYS PLANNING PROCESS

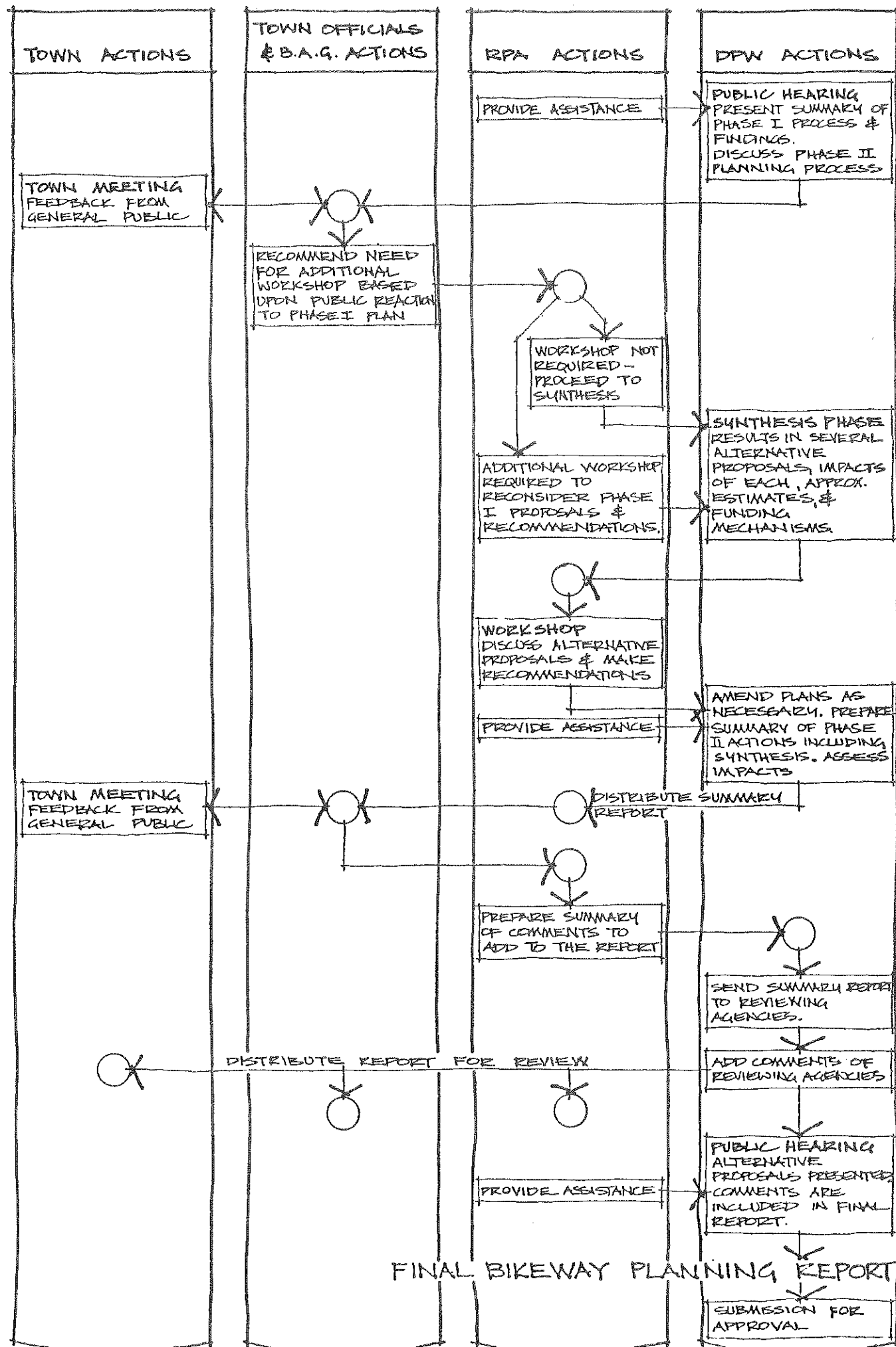
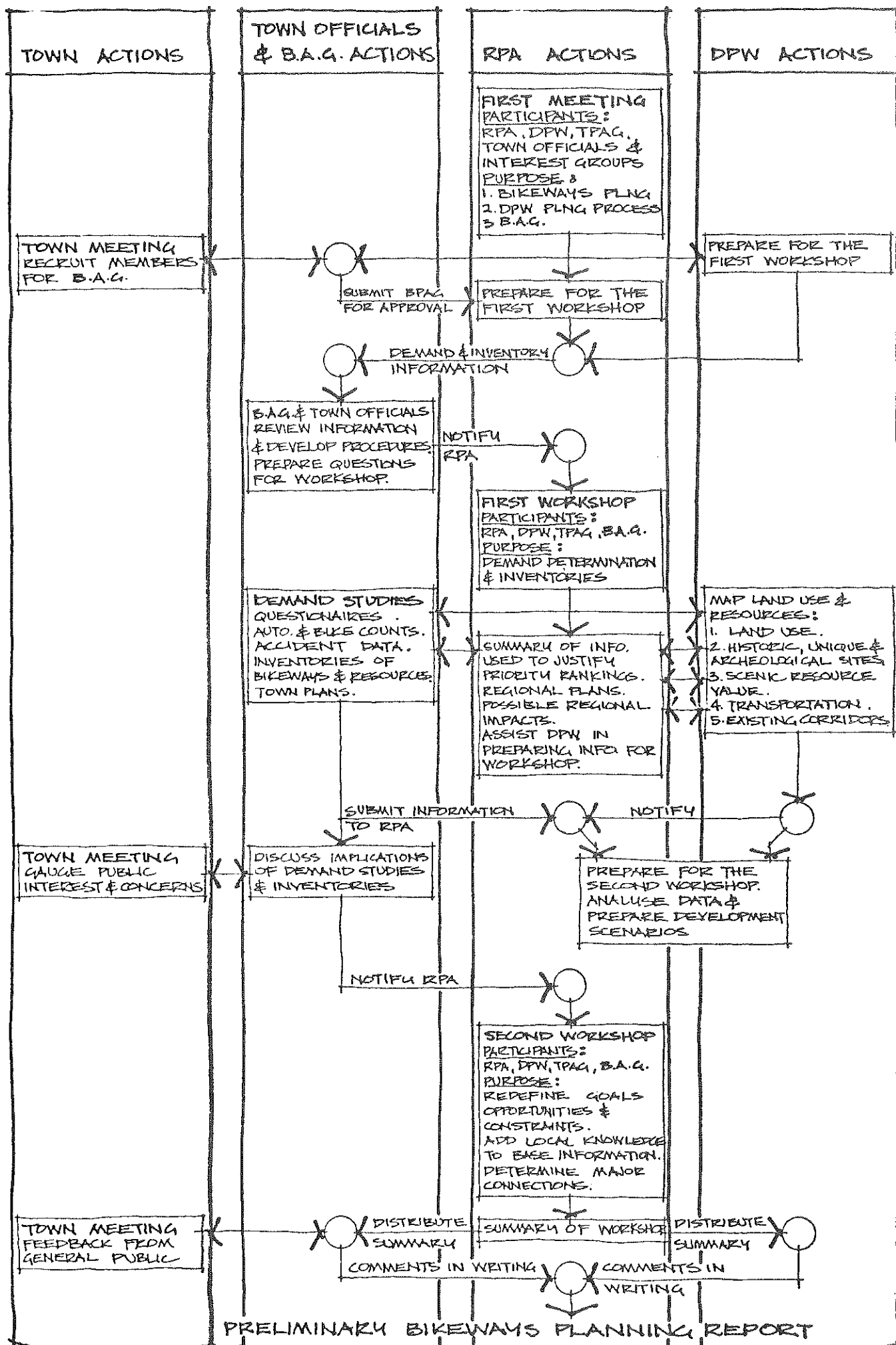


FIGURE 1

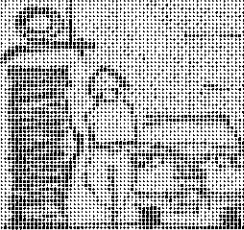
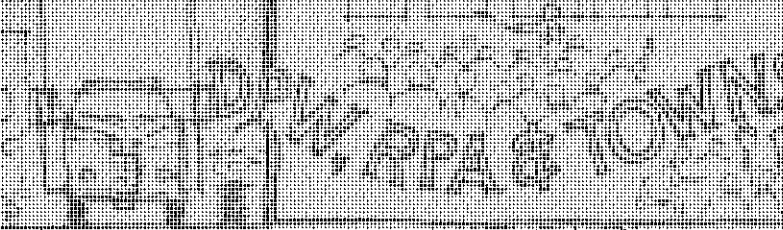
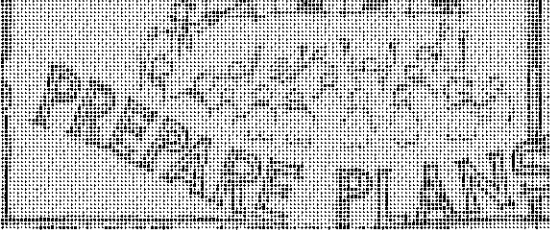
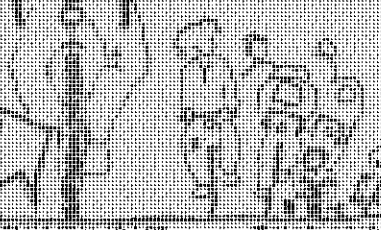
SUMMARY: PHASE I BIKEWAYS PLANNING PROCESS



FIGURE

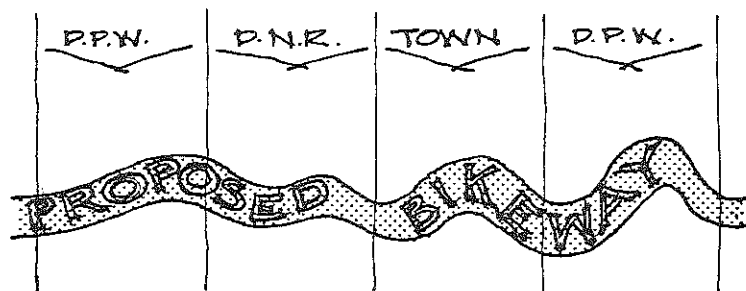
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BIKEWAYS: FUNDING

CONCEPTS & BASE	PUBLIC MEETINGS &	ADDRESS IMPACTS &	SECURE BIKWAYS
			
CONCEPTS & BASE	PUBLIC MEETINGS &	ADDRESS IMPACTS &	SECURE BIKWAYS

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL 1983



SEVERAL AGENCIES MAY
BE INVOLVED IN THE
IMPLEMENTATION OF A
BIKEWAYS PLAN.

A GUIDE TO FUNDING SOURCES
IN MASSACHUSETTS

THE D.P.W. MAY PAY FOR THE
FOLLOWING BIKEWAYS
RELATED FACILITIES.

INTRODUCTION

A bikeways plan in many cases will involve more than one agency in its implementation. For example, a proposed route might run through state forest land, parallel a state highway, and continue on town roads. Here, three agencies would be involved, and for each segment, funding requirements would be different. Thus, the following section concentrates on the various sources of funds available to a community planning its bikeway system. The primary emphasis of this report is on DPW funding procedures. However, other potential sources of funds and assistance on the local, state or federal level are also briefly reviewed.

The information contained in this effort is not exhaustive. It should, however, provide a guide to communities planning a bikeway program. Its purpose is to obviate the need for all 351 of the state's cities and towns to separately investigate sources of bikeways funding.

Although great care has been taken to provide the most accurate information possible, programs and their application procedures are subject to change and each agency should be contacted for more current and complete information on their program.

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

The Massachusetts Department of Public Works (DPW) is the agency with primary responsibility for transportation-oriented bikeways in the Commonwealth of Massachusetts. The Department encourages the implementation of bikeways projects that are part of a comprehensive bikeways system plan. However, opportunities to provide safe bicycle and pedestrian facilities in the regular course of highway programs will not be neglected.

In terms of the facility itself, the Department may pay for the following items as part of a bikeway project:

1. The costs of grading, drainage, paving, barriers, landscaping, and structures necessary to accommodate the number of type of users of the facility.

2. The costs of supplementary facilities such as parking facilities and bicycle storage facilities, where appropriate.
3. The costs of traffic control devices including signs, signals, and pavement markings.
4. The cost of fixed source of lighting, where appropriate.
5. The cost of curb-cut ramps on new and existing facilities, including those for the physically handicapped.
6. The costs of right-of-way (land acquisition and relocation assistance) on bikeway and walkway construction projects.
7. The costs of walks, barriers and additional widths and lengths on bridges necessary for bikeway and pedestrian walkway continuity.
8. The costs of bikeway and walkway grade separations where:
 - a. vehicular speeds and crossing volumes constitute a hazard so great as to justify the cost of a structure, and the bikeway or walkway cannot be rerouted, or,
 - b. the separation is necessary because the highway has complete control of access.

The following subsections describe funding sources for bikeways on (1) Federal-Aid Highways, (2) state highways and (3) local roads, and provide related information on bicycle and pedestrian facilities.

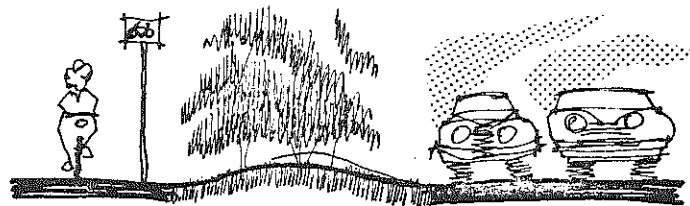
BIKEWAY ON FEDERAL-AID HIGHWAYS

a. Independent Bikeway Projects

The U.S. Department of Transportation, Federal Highway Administration (FHWA) annually provides Federal-Aid Highway funds to the Commonwealth through the Massachusetts Department of Public Works (DPW) for planning, design and construction works. In the past, these funds were used in developing highways, bridges, fringe

THE FHWA PROVIDES FUNDS TO THE COMMONWEALTH THRU' THE DPW FOR HIGHWAY-RELATED PLANNING & CONSTRUCTION WORK.

SECTION 124 OF THE FEDERAL AID HIGHWAY ACT OF 1973 ALLOWS FEDERAL AID HIGHWAY FUNDS TO BE USED FOR PEDESTRIAN & BICYCLE FACILITIES.



BIKEWAYS COMPETE WITH OTHER PROJECTS FOR FUNDS.

and corridor parking facilities and rest areas.

Section 124 of the 1973 Federal Highway Act allows spending of Highway Trust funds on bicycle facilities with a national limit of forty (40) million dollars. The bonds are not specifically earmarked for Bikeways. The maximum amount allowed for an individual state to spend on independent Bike-way projects (those projects not in connection with highway improvements) is two (2) million dollars. These funds are equally competitive with all other uses of the Highway Trust funds, i.e., new roads and safety projects. Bicycle facilities built in conjunction with highway improvements are not part of this two (2) million dollar limit. Moreover, each project must have specific concurrence of the DPW before funds can be obligated.

Bikeways may be constructed on existing Federal-Aid highway rights-of-way or on special rights-of-way acquired for this purpose. Where bikeways are to be located away from highway rights-of-way, they must serve bicycle and pedestrian traffic which would normally use the Federal-Aid highway route.

The FHWA allocated funds to the interstate highway system as well as to a wide variety of primary and secondary roads and urban highways. The limit of the Federal-Aid share of the interstate system project cost is 90%. The other roads on the Federal-Aid system receive 70% funding from the FHWA. In all cases, the remaining share is provided by the state. Of the total highway mileage in the United States, about 25% is on a Federal-Aid system. To determine if a roadway is on the Federal-Aid highway system, contact either the DPW's Bureau of Transportation Planning and Development, 190 Portland Street, Boston, MA 02114 or the FHWA Massachusetts Division Office, 1517 Summer Street, Boston MA 02140.

b. Incidental Bicycle Projects

The Department may construct bicycle and pedestrian facilities as incidental features of highway construction projects when the bikeway or walkway is to be constructed concurrently with the improvement for motor vehicular traffic and the bikeway or walkway will be within the normal right-of-way of the highway. Land acquired for traffic improvements and scenic enhancement programs can also be used in the construction of incidental bikeway facilities. Projects constructed as incidental features of larger highway construction projects may be financed with the same type

of Federal-Aid funds and are not subject to funding limitations for independent bikeway or walkway projects.

c. Highway Beautification Act

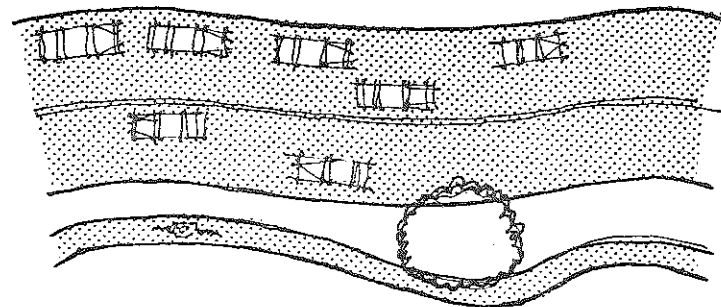
The FHWA is also authorized by the Highway Beautification Act to provide funds "to assist State highway departments in landscaping and roadside development" and other activities. Local project proposals may be submitted to the DPW through the regional planning agency.

Although bikeways themselves cannot be constructed with these funds, this program may be used to pay for related facilities such as rest areas, landscaping and scenic overlooks. Thus, a community may construct a bikeway and then apply for roadside development monies from this source.

d. Funding Requirements

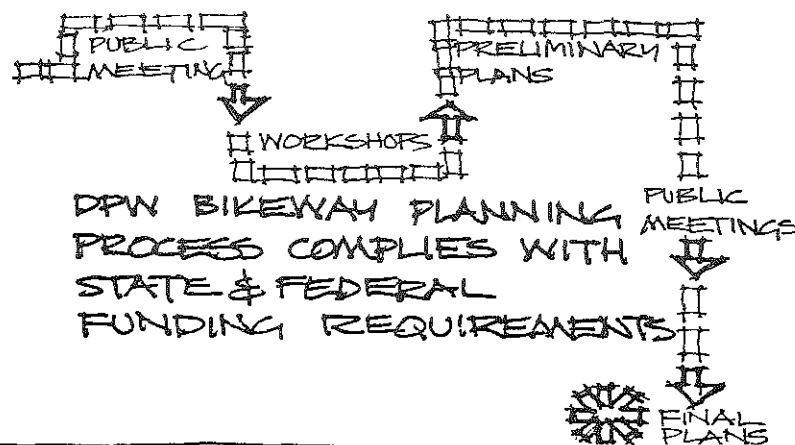
All of the provisions of the Federal-Aid Highway Program are applicable to bicycle facilities projects. These include provisions for public hearings and the submission of an environmental assessment form and possibly an environmental impact statement. The planning procedures and data gathering techniques provided for in the DPW bikeway planning process fulfill these federal and state requirements. The DPW bikeways planning process also considers a wide range of factors important in developing a bikeways plan and necessary to justify a proposal. These include:

- estimated costs
- annual bicycle sales or registrations if available
- bicycle use levels on streets and arterials
- bicyclist accident rates in the project areas
- expected safety benefits
- ease of access to bicyclists
- level of community support (via household questionnaires)
- unique local characteristics relevant to the need for a bikeway facility
- natural, cultural and historic elements which would affect the siting of a bikeway
- need for other structures, safe parking facilities, traffic control systems, etc.



BIKEWAYS MAY BE BUILT & FINANCED AS PART OF A HIGHWAY PROJECT.

BIKEWAYS ARE SUBJECT TO A SIMILAR PLANNING PROCESS TO THAT REQUIRED FOR OTHER PROJECTS INVOLVING FEDERAL HIGHWAY FUNDS.



--and any other pertinent information which might serve to justify the expenditure of state and federal funds on the proposed bikeways project.

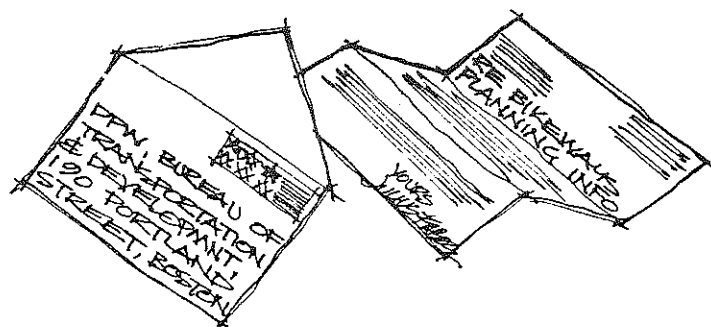
Consideration of these factors is essential if funding for a bikeway is to be made available. Therefore, in order to avoid frustrating delays resulting from misinterpretation of requirements, the DPW recommends that communities wishing to apply for federal/state funding follow the DPW planning process.

Funding of bicycle and pedestrian facilities may be approved where the following conditions are satisfied:

1. The facility will contribute to the safety of all road users: cyclists, pedestrians, as well as motorists.
2. The facility will connect with any existing facilities usable by bicyclists or will form a segment of a proposed system.
3. A public agency has formally agreed to:
 - a. operate and maintain the facility
 - b. ban all motorized vehicles on bikeways (except maintenance vehicles)
4. The facility can reasonably be expected to have sufficient use in relation to cost to justify its construction and maintenance.

A realistic appraisal of funding possibilities can usually be obtained through a community's elected representatives in the legislature. These are a valuable resource whose potential assistance in representing the interests of local citizens should never be overlooked.

More information about the DPW bikeways planning process can be obtained from the Department of Public Works, Bureau of Transportation Planning and Development, 190 Portland Street, Boston, MA 02114.



CONTACT THE DPW FOR INFORMATION ABOUT THE BIKEWAYS PLANNING PROCESS

BIKEWAYS ON STATE HIGHWAYS

Most of the roadways designated "state highways" in Massachusetts are included in the Federal-Aid system and bikeways proposals involving these roads would therefore be funded accordingly.

However, some of these "state highways" are road segments under a mile in length and are not, in many cases, included in the Federal-Aid system. Federal-Aid funds may not generally be applied in such cases. These road segments are inventoried by the DPW's Right-of-Way Division, 100 Nashua Street, Boston, MA 02114. Should a local bike route plan involve a stretch of this state roadway, the local agency should contact the DPW District Office in order to make the proper arrangements for its use as part of the bikeways project.

BIKEWAYS ON LOCAL ROADS

Municipalities are authorized to provide bikeways and designate bikelanes on existing roadways. The following state funding sources pertain only to bikeways work to be conducted by local governments on local roads. Any of these funds may be applied to bikeways work. However, since the sum of money a community receives under these programs cannot exceed a specified amount which is generally used to maintain and upgrade local roads, a proposal for funding bikeways with these monies must consider the tradeoffs involved.

Chapter 765: This law authorized a \$50 million bond issue with funds being distributed by formula over the four year period through fiscal 1977. Like Chapter 90, which it superceded, Chapter 765 spending levels for each community are established by formula. This full level of funding is reimbursed to the community when its roadway expenditures for the year have met or exceeded the assigned amount. When spending does not reach the level permitted by the formula, the reimbursement covers only the amount of the expenditure and remaining monies are forfeited by the community. Chapter 765 requires no local matching contribution.

LOCAL GOVERNMENTS MAY USE
STATE FUNDING TO BUILD
BIKEWAYS ON LOCAL ROADS —
SPENDING ON BIKEWAYS MEANS
LESS MONEY FOR ROADS

~~CHAPTER 90~~

REPLACED BY → CHAPTER 765

CHAPTER 1140 SUPPLEMENTS CHAPTER 765 MONIES

CHAPTER 825

CHAPTER 497 - ONE CENT/ GALLON TAX ON GASOLINE

CHAPTER 90 MAY BE REACTIVATED WHEN CHAPTER 765 EXPIRES

Chapter 1140: This is a one-time appropriation under section 20 which supplements Chapter 765 monies and must be spent by communities by July 1, 1977. Funds may be spent for the same purposes as Chapter 765 funds.

Chapter 825: This is another one-year appropriation for transportation purposes, the first portion of which was distributed in December 1974 with the remaining funds to be sent to the communities in December 1975. This, like Chapter 1140, is a supplement to Chapter 765 funding. This Act also provides some additional funds which are channelled to communities via their Cherry Sheets.

Chapter 497: This law established a fund with monies collected from an additional one cent per gallon tax on gasoline. The money derived from this fund is distributed on a formula basis and is used to cover general highway related expenditures on local roads.

Chapter 90: In the past, annual direct legislative appropriations have provided funds to municipalities by formula for construction, reconstruction, improvement, and maintenance of local roads. Funding was 50% state, 25% county and 25% local. There is presently no funding under this law, although it may be reactivated in the future by the legislature when Chapter 765 expires.

There are a number of bills presently pending in the state legislature which would provide additional bikeways funding and more assistance to communities for planning and implementation.

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

The Land and Water Conservation Grants Program, administered by the U.S. Department of the Interior through its Bureau of Outdoor Recreation, provides matching grants to state agencies for the acquisition and development of land and facilities for a wide range of outdoor recreation projects including bike trails.

This fund is administered in Massachusetts by the Department of Natural Resources (DNR). Priority consideration is generally given to projects serving urban populations. Money is not available for the operation and maintenance of facilities.

The Department of Natural Resources will reimburse communities for up to 50% of the project cost. This money can be used for land acquisition, planning, construction or any combination of these. A community can also request from DNR the reimbursement of up to 50% of the value of fromdonated land intended for future projects. Proposed projects must be located on municipally owned land.

DNR also provides advisory assistance in the planning and design stages and supplies technical information useful in planning, developing, financing and managing outdoor recreation programs.

To initiate the process, the municipality must send a letter of intent to the Commissioner of Natural Resources indicating the scope of the program and provide proof of community support. A DNR representative will visit the project site for consultation concerning the project's viability. Subsequent meetings consider project development details.

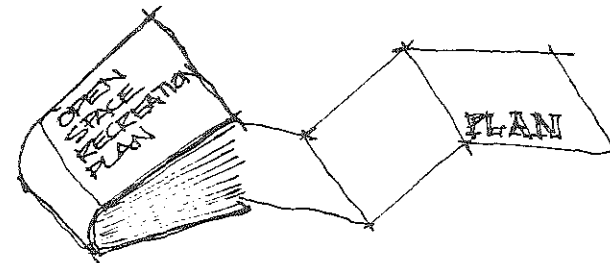
Communities applying for funding under this program are required to have an open space recreation plan or a master recreational program which is less than five years old.

For further information or assistance, contact the Director of Conservation Services, Department of Natural Resources, 100 Cambridge Street, Boston, MA 02202. Telephone: 617 727-3170.

THE METROPOLITAN DISTRICT COMMISSION

The water resource management activities of the Metropolitan District Commission have placed large areas of land under its control. While the primary activities of the MDC are concerned with providing water to the Boston area, the lands under its control are also used for recreation (including cycling) and other activities compatible with water supply management. Areas under MDC control include a number of highways and parkways, aqueducts, reservoirs, and sewage systems. These are located in the Boston metropolitan area as well as in other parts of the state.

Bikeway proposals will be considered for funding by the MDC if the facility is to be built on MDC property and if the proposed bikeway ties into a regional system. Funding is from separate sources within



OPEN SPACE RECREATION PLAN IS
A REQUIREMENT OF DNR PROGRAM

the MDC depending on whether the facility is intended for recreational or other purposes. Approved proposals will be planned and constructed by the MDC, which will then assume responsibility for maintenance and law enforcement.

In order to determine whether a particular property can be used for bikeways, or to obtain further information about the MDC bikeways program, please contact the Metropolitan District Commission, 20 Somerset Street, Boston, MA 02108.

COMMUNITY FACILITIES LOAN PROGRAM

U.S. DEPARTMENT OF AGRICULTURE

The Farmer's Home Administration, a division of the Department of Agriculture, administers a Community Facilities loan program which was established by the Rural Development Act of 1974. The program provides loans for the construction and design of town halls, fire stations, and other community facilities, including bikeway facilities.

The loans are available to towns with a population of 10,000 or less and carry an interest rate of 5% per annum with a maximum term of 40 years. Loans are granted only to communities which are unable to obtain credit from other sources, i.e., this must be their only possible source of credit. Loans normally will be available when the project is completed. However, for projects costing \$50,000 or more, if interim financing is not available, multiple advances are possible.

Loans from this source may be used to cover the local share of programs which require local matching in conjunction with state grants (such as the 50% share required by the Department of Natural Resources).

More information may be obtained by contacting the Farmer's Home Administration offices in Massachusetts:

Hadley	413 586-1533
Holden	617 829-6502
Pittsfield	413 499-4766
Raynham	617 822-7141

Until the end of fiscal 1974, the Department of Agriculture also funded a Cropland Adjustment program under its Agricultural Stabilization and Conservation Service. The purpose of the program was to help pay for improvements to cropland and to preserve rural farmlands. Under the expectation of preserving such lands, bikeways could have received funding. However, the program was not funded for fiscal 1975. If monies should become available at a later date, the reactivated program could be a funding source for bikeways in rural sections of the state.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Bikeways may also be funded through the U.S. Department of Housing and Urban Development (HUD) which administers the Community Development Act of 1974 (CDA). Title I of this new Act replaces a number of HUD Programs including Open Space, Urban Beautification, Public Facility Loans, Neighborhood Facilities Grants, and Urban Renewal. In general, funds received under this title may be used to assist the type of activities which were eligible under the prior community development programs. These include preservation or restoration of historic sites, urban beautification, conservation of open space, preservation of scenic areas, provision of recreation facilities, and the guidance of urban development. The program provides funds for purchase of land as well as site improvements, including streets, lighting, malls, walkways or bikeways.

HUD FUNDS FOR BIKEWAYS

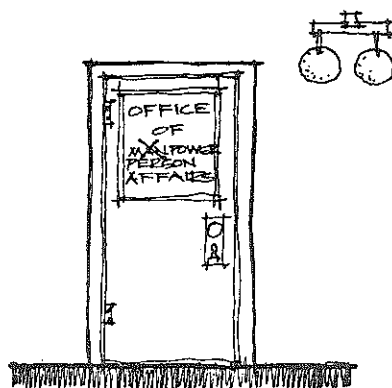
Where funds for outright purchase are not available, the CDA program also provides loan guarantees to finance property acquisition undertaken to facilitate the implementation of eligible proposals.

LOAN GUARANTEES

Planning for bikeways and bike facilities is a permissible activity for city and regional planners whose salaries are subsidized by monies from the Section 701 Comprehensive Planning Grants program, as revised by Title IV of the new act.

PLANNING THRU¹ SECTION 701 OF C.P.G. PROGRAM.

Further information may be obtained at the Boston Area Office of HUD, 15 New Chardon Street, Boston, Massachusetts. Telephone 617 223-4148.



CETA FUNDS THRU' OFFICE OF MANPOWER AFFAIRS

OFFICE OF MANPOWER AFFAIRS

U.S. Department of Labor funds, authorized by the Comprehensive Employment and Training Act (CETA), are administered by the Massachusetts Office of Manpower Affairs. Though the Act is mainly concerned with various training and job placement programs, Title VI funds may be used by state or local governments to provide labor for various projects. CETA funds may therefore be used to employ persons in the planning and/or construction of bikeways and related facilities.

Major unemployment areas (i.e., cities, consortia or local governmental units with populations in excess of 100,000 persons and having at least 6.5% unemployment) may receive CETA program funding. These currently include Boston, Cambridge, Lowell, New Bedford, Springfield and Worcester.

The two areas where bikeway projects may find some assistance are:

1. "on-the-job training" funds provided to private industry (where the agreement is for 50% reimbursement of training costs) may encourage civic-minded local firms to donate labor to bikeway projects.
2. public service jobs provided to non-profit and public agencies where the reimbursement is 100%. Persons employed under this provision may be added to local public works staff and utilized in local bikeways construction projects.

For further information on CETA grants, contact Cay Stratton at the Office of Manpower Affairs, Charles F. Hurley Building, Boston, Massachusetts. Telephone: 617 727-7675.

NATIONAL PARK SERVICE

In areas where the proposed route for a bikeway crosses lands administered by the National Park Service, assistance from the park service may be available. If the need for such a facility can be adequately justified, the park service will plan, design and construct all parts of the facility located on its property. Other parts of the bikeway will have to be funded from other sources.

The National Park Service also operates several technical assistance programs for state and local agencies, including:

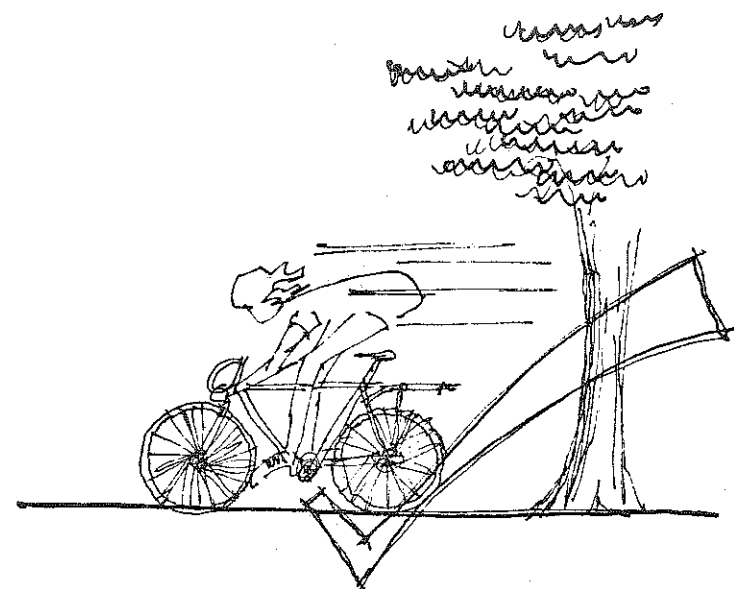
1. The Park Practice Program offers a means of disseminating information to park and recreation officials about tried and proven designs and plans for park structures and facilities, including bikeways, as well as methods of administration and operation of recreation areas. The Park Practice Program is a cooperative program of the National Park Service and the National Recreation and Park Association, 1601 North Kent Street, Arlington, Virginia 22209.
2. The Park and Recreation Technical Assistance Program which consists of technical and advisory services on such matters as agency organization, personnel training and general development planning. A Bikeway Planning and Development seminar could be established by the Training Institute with costs shared by the interested agency. A letter explaining the need for assistance should be addressed to the National Park Service Training Institute, Harper's Ferry, West Virginia 25425.

The North Atlantic Regional Office of the National Park Service is located at 150 Causeway Street, Boston, MA 02114. Telephone: 617 223-3766.

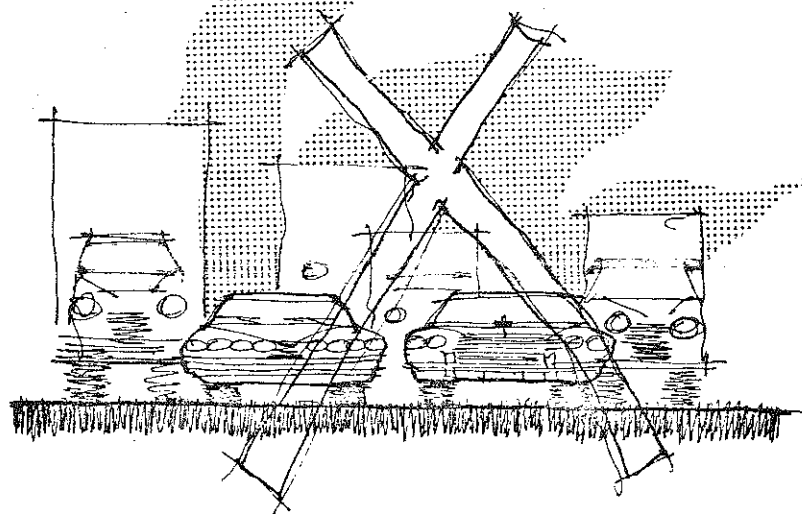
ENVIRONMENTAL PROTECTION AGENCY

Some funding for bikeways may be available from the Consolidated Program Grants for Environmental Protection which are administered by the Office of Planning and Management of the Environmental Protection Agency (EPA). The objective of this program is "to enable states to coordinate and manage environmental approaches to their pollution problems. Consolidated grants are allocated to states for management of environmental protection activities, among which are air pollution control, water pollution control, and solid waste management."

The EPA is now in the process of formulating a policy regarding its role in the development of bikeways. Bikeway construction proposals with the potential for reducing motor vehicle traffic levels in certain specified areas may prove to be eligible for EPA funding if



**BIKEWAYS AS A MEANS OF
REDUCING AUTO TRAFFIC &
IMPROVING AIR QUALITY**



**EPA CONSOLIDATED PROGRAM GRANTS
FOR ENVIRONMENTAL
PROTECTION.**

an agreement can be secured from both the Boston Regional Office of the EPA and the Massachusetts Office for Environmental Affairs on a project by project basis.

The Executive Office of Environmental Affairs of the Commonwealth of Massachusetts is located at 18 Tremont Street, Boston, MA and the Environmental Protection Agency, Boston Regional Office is located at the JFK Federal Building, Government Center, Boston, MA 02203.

U.S. ARMY

The U.S. Army can, by agreement with a community, design a bikeway and provide construction labor if so requested. The Army Reserve Command has the necessary construction equipment. The municipality must plan the location of the route, and provide all materials and secure necessary property rights.

The two main considerations of the Army in reviewing requests from communities for assistance in bikeways development are:

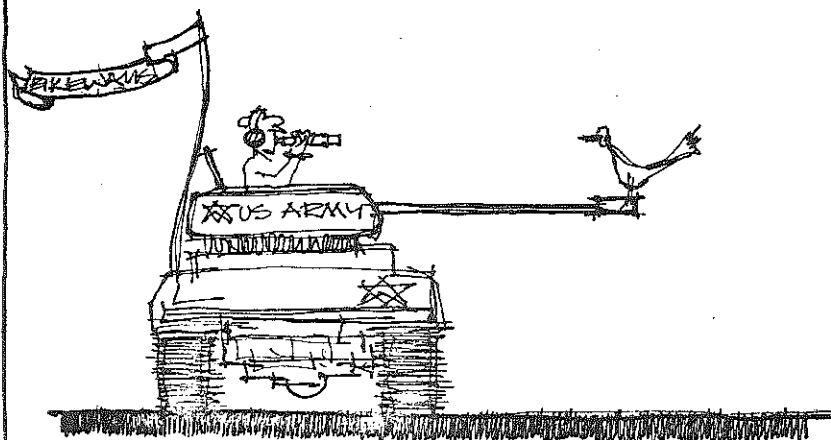
1. Design: The work must be of such a nature that it will serve as a beneficial project for designers in the Army training program.
2. Labor: Labor may only be provided in cases where the Army is able to obtain a release from the relevant contractors' unions.

Inquiries should be addressed to the 329th Engineering Group, Boston WSAR Center, 666 Summer Street, Boston, MA 02210. Telephone: 617 542-6000.

Interested communities may find similar assistance available from the National Guard, U.S. Army Corps of Engineers or other branches of the military.

DEPARTMENT OF PUBLIC UTILITIES

Utility rights-of-way are often suitable routes for bikeways. If a community is considering use of a utility right-of-way or other



utility company property arrangements must be made with the firm involved. It should be noted that not all lands used by utilities as rights-of-way are owned by the companies. Often only easements have been obtained from other owners. Where this is the case, arrangements will have to be made both with the relevant utility and the property owner(s).

For further information, contact the Department of Public Utilities at 617 727-3634.

PRIVATE DONATION

Money, materials and manpower have, in some cases, been donated by private individuals and firms. Local construction firms may donate use of their construction machinery where a community has none. Land owners are sometimes willing to donate land or easements to the community for bikepaths.

Local bikeways systems plans may be developed by citizen groups, bicycle clubs, conservation organizations or other private sources. Students in graduate architectural and landscape design programs may be willing to assume some of the design work for a bikeway.

In cases where community funding resources for bikeways projects are limited, donations may play a key role in keeping project costs at an affordable level.

MASSACHUSETTS BICENTENNIAL COMMISSION

The U.S. American Revolution Bicentennial Administration provides matching project grants to the Massachusetts Bicentennial Commission to stimulate and promote Bicentennial projects in the state. These funds are available "to assist in developing and supporting Bicentennial projects", including bikeways. The state share of funds for such projects is provided by funds appropriated under Chapter 686 of Massachusetts General Laws.

The Bicentennial Commission received applications for bikeways funding for routes or facilities which relate to the efforts of the Commission or where historical significance is shown. Applications

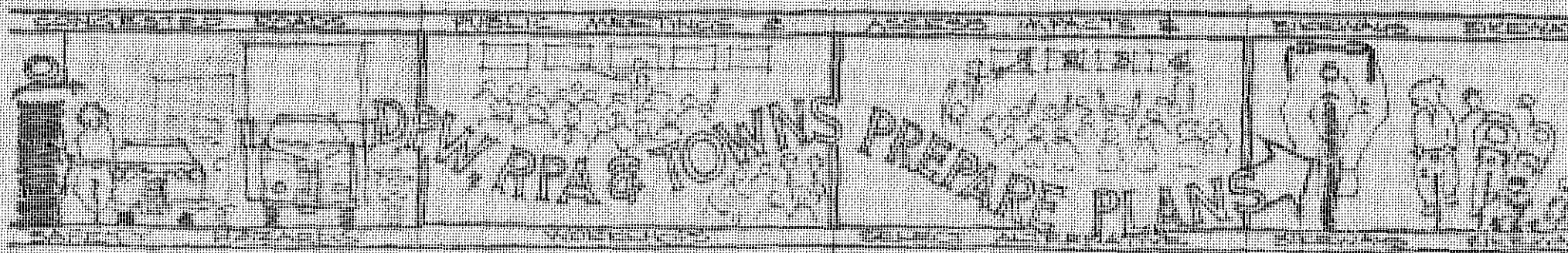


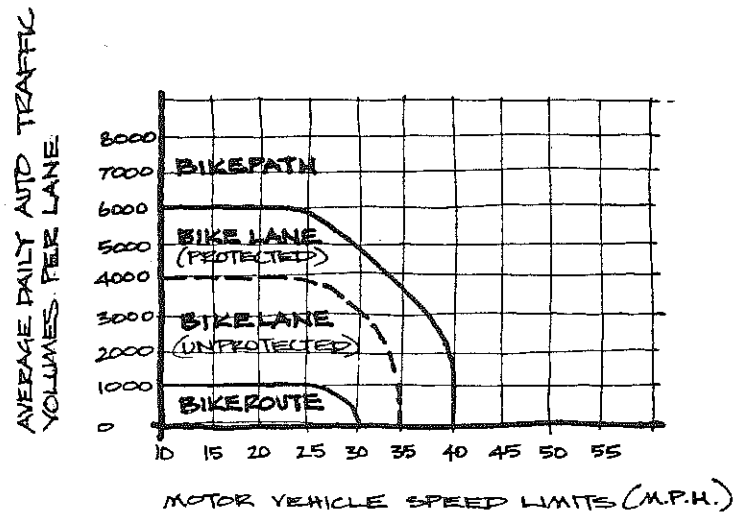
ASSISTANCE FROM STUDENTS
IN DESIGN & PLANNING
RELATED PROGRAMS.

can be made by a local agency or non-profit organization. Special emphasis is placed on joint community projects. At the time of application for a specific project proposal, a letter of approval and/or support from each of the communities involved in the proposal is required. A maximum of \$15,000 can be granted per municipality unless the applicant can demonstrate statewide or regional significance. Funding is on a competitive statewide basis and the money is granted on the basis of a 50/50 matching program.

For more information, contact the Massachusetts Bicentennial Commission, 10 Tremont Street, Boston, MA 02108. Telephone: 617 523-3410.

BIKEWAYS: DESIGN STANDARDS

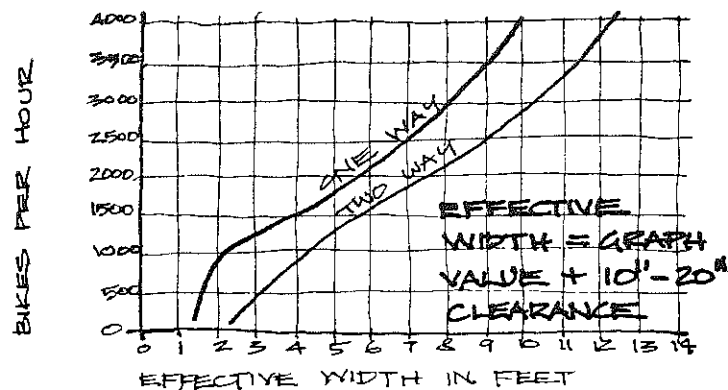




NOTE: THE ABOVE FIGURES SHOULD NOT BE TAKEN AS ABSOLUTE VALUES.

RELATIONSHIP OF TRAFFIC SPEED & VOLUME TO BIKEWAY DESIGN

FIGURE 1.



BIKEWAY DESIGN CRITERIA

The following design criteria represent the most commonly encountered factors of bikeway design. Although applicable to most situations, local conditions may require special consideration. While well designed facilities will influence bicyclist safety, the full benefits of these improvements will only be attained in conjunction with an extensive community-wide safety education program.

WHAT TO BUILD?

Figure 1 indicates the relationship of traffic speed and volume to bicycle facility design (Barton-Aschman Associates, 1974). This criteria is not absolute but serves as a guide to selecting appropriate and safe facilities. Many other factors such as economics and regional goals will also play a significant role in the final decision.

DESIGN SPEED

Design speed is the maximum speed at which a bicyclist can safely negotiate a bikeway. Primary controlling factors are downhill grades, curve radii and frequency of intersections. The recommended design speed is 20 mph, except for down grades steeper than 7% where 30 mph is more appropriate (Oregon State Highway Division, 1974).

RADIUS OF CURVES

The proper minimum radii for curves can be derived from Figure 2 (Oregon, 1974). For example, at a design speed of 20 mph, a 50 feet to 60 feet minimum radius is recommended.

SUPERELEVATION OF CURVES

As shown in Figure 2, superelevation will influence the choice of curve radii. Superelevation can be applied to all curves to benefit the rider and to assist surface drainage. Amounts should be from a minimum of 0.02 ft/ft to a maximum of 0.12 ft/ft.

$$\text{PLOT OF } \frac{V^2}{gR} = \frac{\tan \theta + f}{1 - f \tan \theta}$$

WHERE:

V = VELOCITY, FT/SEC

g = ACCELERATION DUE TO GRAVITY, FT/SEC²

R = RADIUS OF CURVATURE, FT

f = COEFFICIENT OF FRICTION

ON DRY PAVEMENT = 0.4

$\tan \theta$ = SUPERELEVATION RATE, FT/FT

DESIGN SPEED :

20 MPH IS THE RECOMMENDED DESIGN SPEED EXCEPT ON DOWN GRADES WHERE 30 MPH IS MORE APPROPRIATE. WITH UP GRADES OVER 3% , 15 MPH. IS A REASONABLE DESIGN SPEED.

USE OF THE GRAPH :

WITHIN THE LIMITS SHOWN A RADIUS OR SUPERELEVATION CAN BE SELECTED TO SUIT A GIVEN SITUATION. (E.G. WHEN V=20MPH A CURVE WITH A RADIUS OF 64 FT. & 0.02 FT/FT SUPERELEVATION WOULD BE APPROPRIATE, AS WOULD A CURVE OF 48 FT. AT 0.12 FT./FT.)

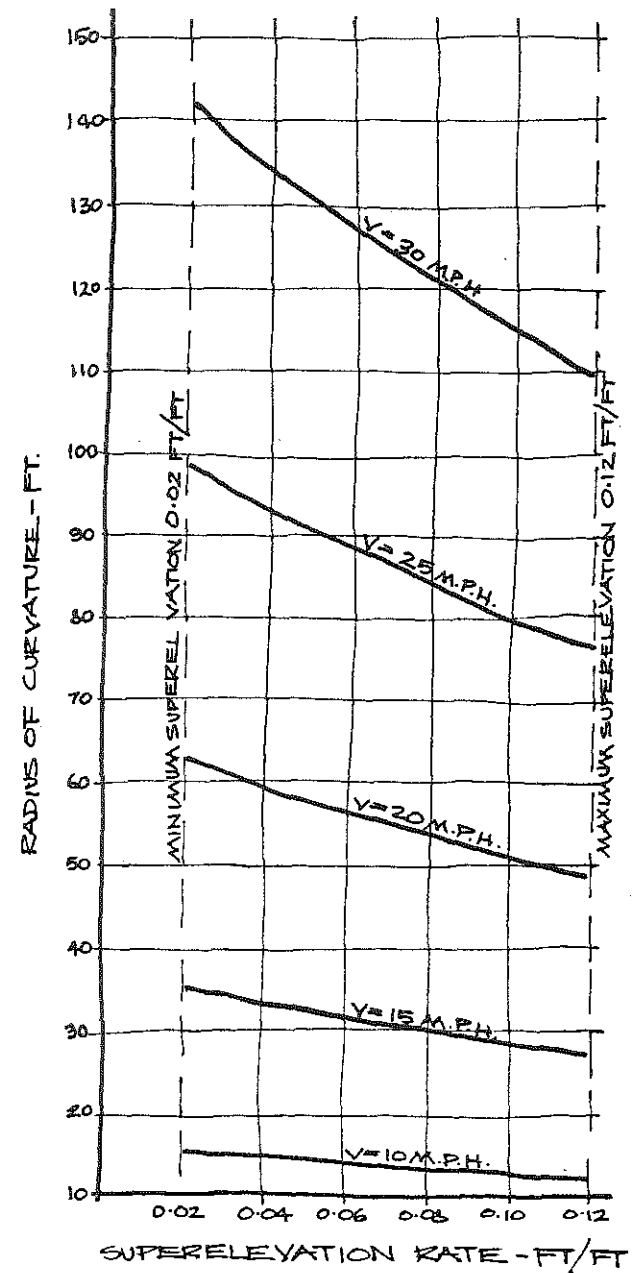
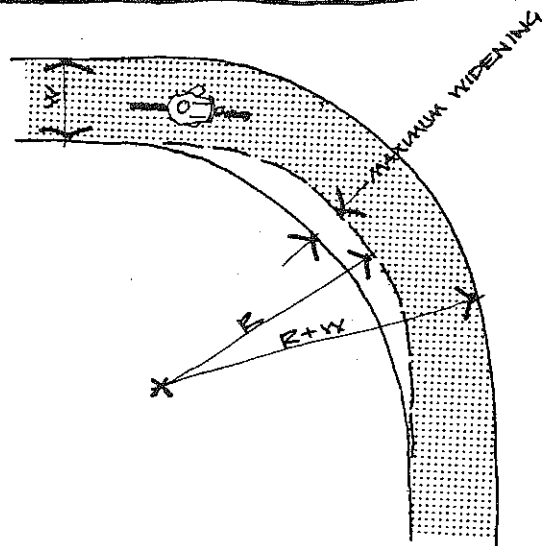


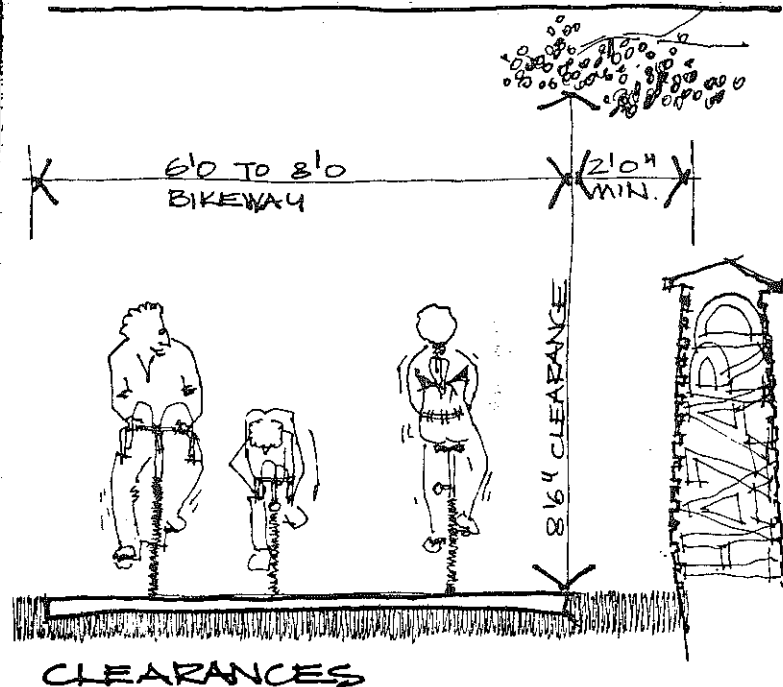
FIGURE 2.



R = RADIUS OF CURVATURE
 W = WIDTH OF BIKEWAY

MAXIMUM WIDENING = 4'0"

FIGURE 3



CLEARANCES

CURVE WIDENING

When the radius of a curve is less than 100 ft., the bikeway surface should be widened on the inside of the curve to compensate for cyclist lean during the turn. As shown in Figure 3, widening need not exceed 4 ft. (Oregon, 1974).

SIGHT DISTANCES

Vertical and horizontal curves should be aligned to provide adequate sight distance for safe riding. This is necessary to provide a clear view of potential hazards with adequate time for evasive action.

GRADES

Grades should be kept below 5% wherever possible, and should never exceed 10%. When long grades steeper than 5% are unavoidable, consideration should be given to providing level stretches on which cyclists can rest or recuperate. The relationship between length of grade and gradient is indicated in Figure 4 (Oregon, 1974).

DIMENSIONS

Most bikeways should be designed to accommodate a minimum of two bicyclists in width. The recommended minimum width is 6.0 feet but 8 feet is more desirable for a bikepath, bikelane and biwalk. On separated paths, it is important to ensure that bikeways are wide enough to accommodate maintenance vehicles.

CLEARANCES

Lateral clearances beyond the edge of the bikeway surface should be a minimum of 2.0 feet when it is not possible to provide the minimum clearances, hazards should be clearly marked. A minimum vertical height of 8.5 feet will allow adequate clearance for the rider. However, on bikepaths, the size of maintenance vehicles may dictate vertical clearance.

SURFACE MATERIAL

It is necessary for the surface to be capable of supporting bicycles and maintenance vehicles. The surface material used in constructing a bikeway should be easily maintained, well drained and offer a smooth, comfortable ride. When properly applied, concrete, bituminous asphalt and stabilized earth are appropriate materials. Of these materials, bituminous asphalt may generally be the most suitable.

SUBGRADE

The subgrade must be capable of distributing the load of maintenance vehicles which will probably be the heaviest loading applied. It must also be well drained to reduce frost heave tendencies. A well graded gravel should meet these requirements. The depth of the subgrade depends on local soil conditions.

FROST HEAVE

A well drained subgrade can minimize the seasonal problem of frost heave. However, heavy loading during the freeze-thaw period of early spring can cause breakup of a paved surface. Therefore, heavy maintenance vehicles should be prohibited from the bikeway during this period.

DRAINAGE

The bikeway should be designed to ensure proper runoff of surface water. This is accomplished by sloping the surface of the bikeway and the areas adjacent to it. Subsurface drainage problems may occur and will require special attention.

GRATE HAZARDS

Improperly aligned storm sewer grates can be a serious hazard to bicyclists. The problem can be avoided by (1) realignment or alteration of existing grates or (2) by using a grate design that will not entrap bicycle wheels.

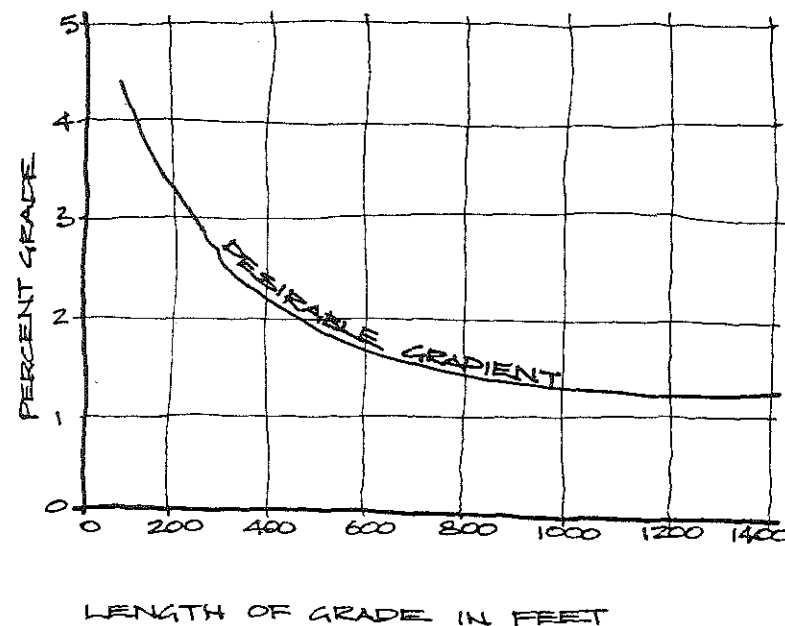


FIGURE 4

CURB CUTS

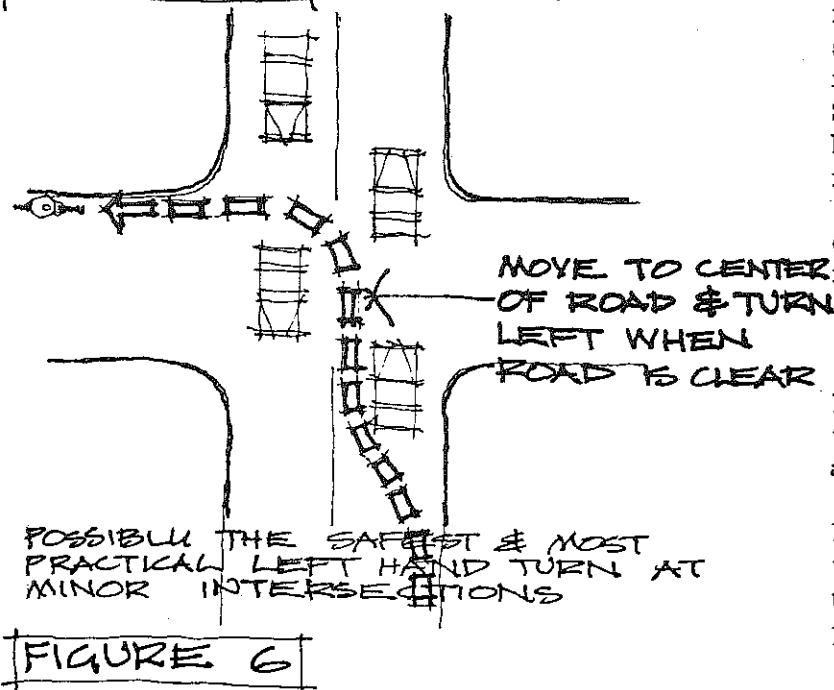
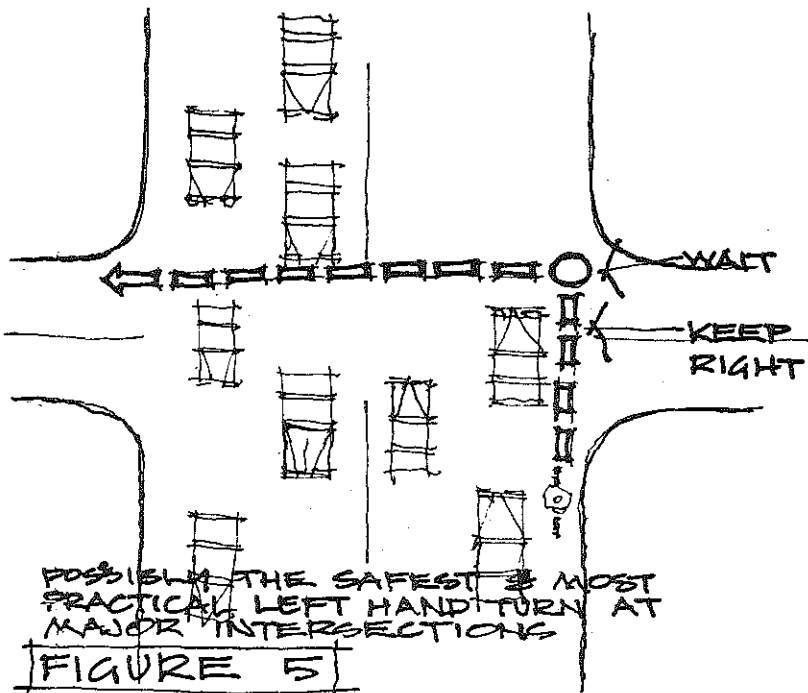
Where curb cuts are necessary, they should be the same width as the bikeway and of a gradient between 10 to 20%. In the case of bikeways, curb cuts should be a minimum of 4 feet wide to accommodate wheelchairs, baby carriages, etc.

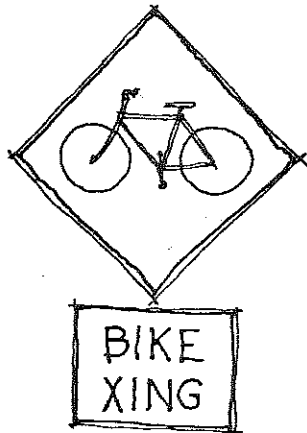
INTERSECTIONS

The greatest number of bicycle accidents occur at intersections. However, accidents can be minimized by taking the following factors into consideration when bikeway-roadway intersections are planned. (1) approaches to all intersections should be clearly visible to all roadway users; (2) warning and directional signs should be provided both along the bikeway and on intersecting streets to caution cyclists and motorists; (3) bikeway stripping should be continuous through all intersections. It may be necessary to augment regular stripping with additional road markings. Markings similar to those at pedestrian crossings may be used. Ideally, bikeway-roadway intersections should be provided with grade separated crossings. However, fiscal limitation will make this impossible in most cases. Several alternative procedures for crossing intersections have been developed, but these require that cyclists and motorists honor their obligations and respect one another's rights. (It should be apparent that without an effective safety education program, expenditures for bikeways will do little to insure cycling safety.)

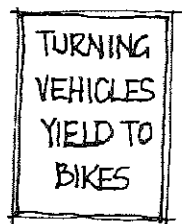
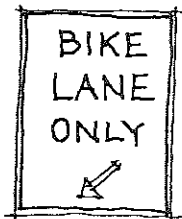
In Figure 5 the cyclist making a left turn first crosses the intersecting street and then waits for a safe time to actually execute the left turn.

In Figure 6 the cyclist maneuvers into the left side of the operating lanes before arriving at the intersection. Once there he proceeds as would a car making a left turn, completing the turn when traffic conditions permit.





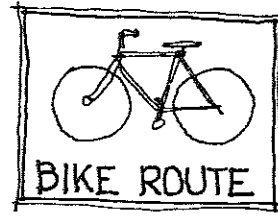
BLACK ON YELLOW BACKGROUND
(UNIFORM MANUAL W11-1)



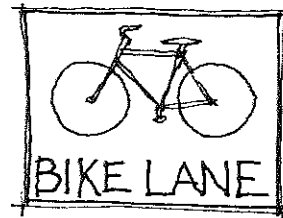
BLACK ON WHITE BACKGROUND

MOTOR VEHICLE
DIRECTED SIGNS

FIGURE 7



(UNIFORM MANUAL D11-1)
STANDARD BIKE ROUTE
SIGN.

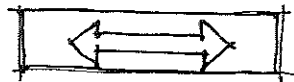
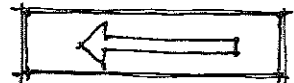
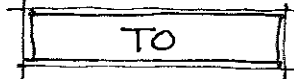


RECOMMENDED SIGN
FOR MASSACHUSETTS

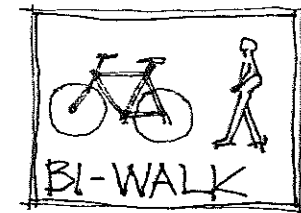


RECOMMENDED SIGN
FOR MASSACHUSETTS

BIKEWAY SIGNS
(WHITE ON GREEN)



EXAMPLES OF MESSAGE
& DIRECTIONAL PLATES
(WHITE ON GREEN)



RECOMMENDED BI-WALK
SIGN FOR MASSACHUSETTS

NOTE: ADDITIONAL INSTRUCTION
PLATES WILL BE NECESSARY

PEDESTRIAN &
BICYCLE FACILITIES

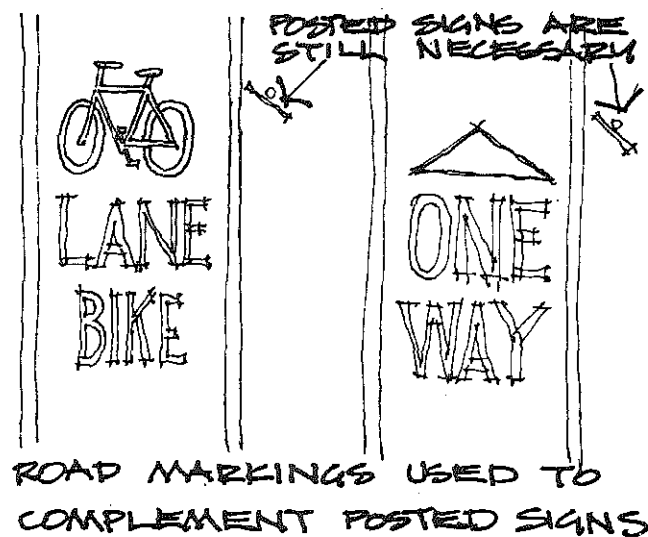


FIGURE 8

Very satisfactory results can be achieved by altering traffic signal sequence to allow for safe bicycle crossings. For example, a 10-15 second delayed green would effectively stop all traffic at an intersection and allow cyclists to cross safely. This method has been used successfully where bicycle volumes are high.

SIGNS

Standard bikeway signing is included in the Manual of Uniform Traffic Control Devices. In Massachusetts, the standard bike-route sign should only be used on bikeroutes. Bike-lanes and bikepaths and biwalks should be marked accordingly (as illustrated in Figure 7). These basic signs should not be altered but additional information should be provided using additional signs. Adequate signs should be posted at all decision points along the bikeway. These signs should not only regulate all traffic, but serve informational purposes as well. For example, signs may be used to indicate distances and directions to community facilities and other areas of interest.

STENCILS

Stencils should be used along with stripes and other markings to more clearly indicate facilities but, while stencils are helpful, they are not to be seen as substitutes for posted signs. Figure 8 indicates some standard stenciled signs.

MAINTENANCE

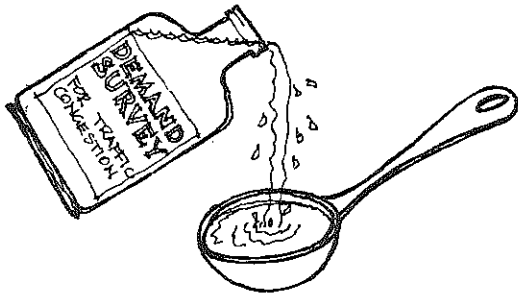
All bikeways must be regularly maintained. This activity will require more thoroughness for bikeways than it does on roadways. Bikeway surfaces must be kept clean of debris and potholes. Signs, stencils and other markings should be in good condition and hence, readable and minimum horizontal and vertical clearances should always be maintained.

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
HIGHWAYS PLANNING DIVISION APRIL 1972

1

DEMAND & NEED DETERMINATION SURVEYS

SAMPLE QUESTIONNAIRES:
COMMUNITY-WIDE SURVEY
BICYCLE RIDER SURVEY
SCHOOL SURVEY



ADMINISTER DEMAND SURVEY
TO 2-3% OF POPULATION

TO CHECK RESULTS USE MORE
THAN ONE TYPE OF SURVEY

DEMAND DETERMINATION FOR BIKEWAY PLANS

In order to help determine the location where bikeways would be most beneficial, your locality should conduct demand and need determination surveys. Samples of the questionnaires you could use have been prepared by the DPW and RPA. Three types of questionnaires have been prepared: one for use in community-wide surveys; one for bicycle rider surveys; and a third for distribution to school age children. These surveys will provide information about traveled routes, intensity of use or related routes, the needs and preferences of bicyclists and other road users in your area, as well as information about the location of bicycle accidents.

COMMUNITY WIDE SURVEYS

One method of gauging bicycle demand is by administering surveys to a portion of the overall population of your region. Sufficient accuracy can generally be obtained by using a sample of two to three percent (2-3%) of the entire population in your area. This type of survey is administered to cyclists as well as non-cyclists. Information gathered can be used to measure overall demand for bikeways in the area (both potential and existing). It can also obtain information from non-cyclist roadway users (i.e., pedestrians and automobile drivers) whose perception of the community's needs may be somewhat different from that of cyclists. It must be remembered that these groups also use the roadway and that their perception of the community's needs must be considered as well.

Several methods of administering this type of questionnaire are considered below; however, in order to make sure that any one distribution method is not yielding distorted results, it is good practice to also conduct a small comparison survey using an alternative distribution method. Thus, if mail distribution is chosen as the primary means of sampling, a smaller sample of telephone responses may be used for testing potential distortion in the mail responses.

Generally speaking, the easiest method of obtaining an unbiased sample is through the telephone directory. For example, if it

is determined that an appropriate sample in your locality would be 1,800 and the phone book has 300 pages of entries, then by drawing six names from each page, we will have created a sample of (300×6) 1,800 names. When selecting a sample group, it is important to make allowance for those who choose not to answer questionnaires. Thus, in a mailed questionnaire, it is advisable to mail three times as many questionnaires as responses desired. In a telephone or door to door survey, twice as many names should be chosen as responses desired.

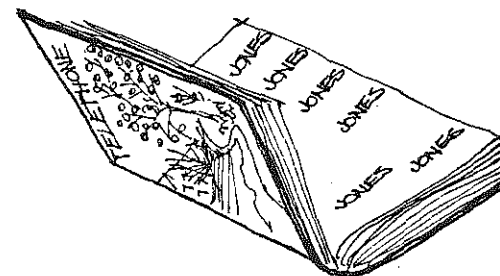
Methods of Distribution

A. Mail

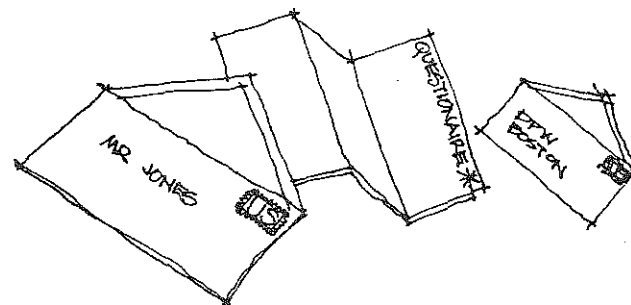
1. Requirements: a) brief (two pages or less); b) prepaid envelope should be included.
2. Advantages: a) low manpower requirements, therefore, lower costs; b) this is a good low-cost method of achieving a large sample.
3. Limitations: a) mail questionnaires usually generate more responses from people with a strong interest in the issue. Thus, the responses may be biased.
4. Expected response rate: 30%

B. Telephone

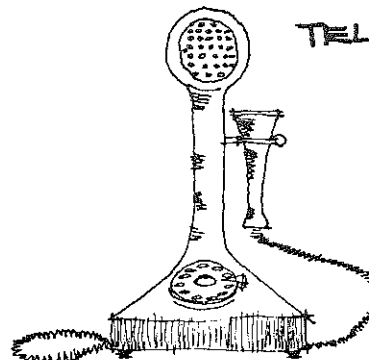
1. Requirements: a) sufficient funds and manpower to conduct a telephone survey.
2. Advantages: a) assures a large response rate; b) draws responses from a more representative sample of the population; c) all misunderstood questions can be easily explained; d) makes gathering information about entire household much easier.



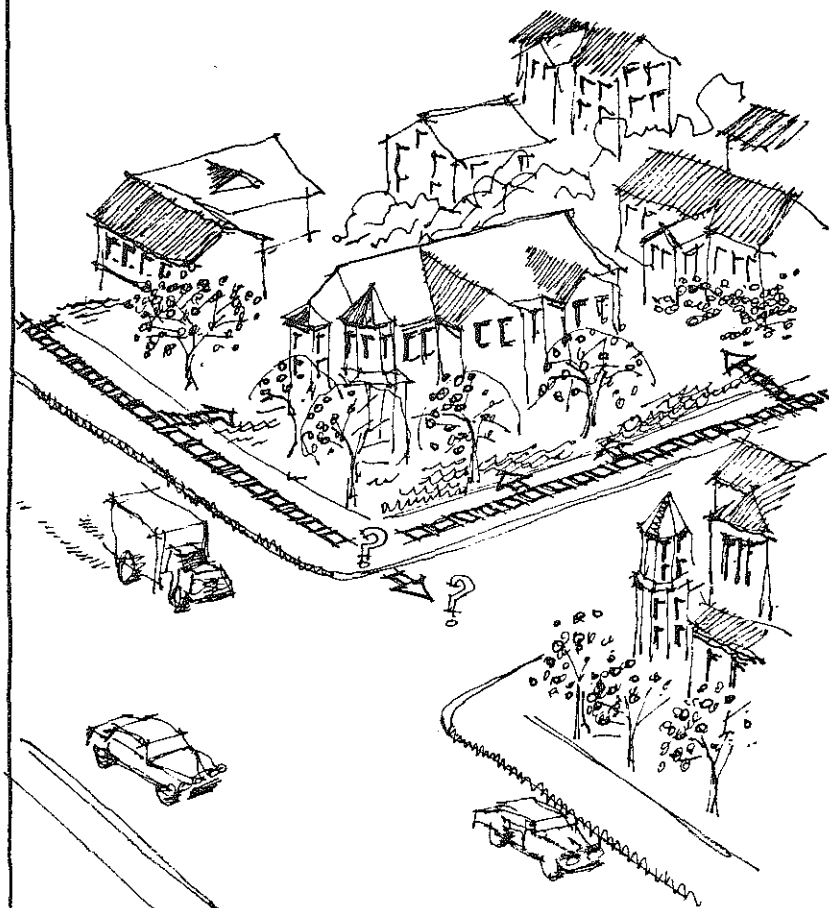
SELECT SAMPLE FROM
TELEPHONE BOOK



DISTRIBUTE BY MAIL



TELEPHONE SURVEY



DOOR TO DOOR TO DOOR TO DOOR
TO DOOR SURVEYS

SCHOOL SURVEYS OR DISTRIBUTION
OF HOUSEHOLD SURVEYS
THROUGH THE SCHOOLS

3. Limitations: a) telephone surveys are best conducted after business hours when more people are at home. This may be a problem if regular office help is used, but would be turned into an advantage by using volunteers who would be free after working hours to help in the work; b) persons administering the questionnaire should be instructed in proper interviewing techniques so as to minimize distortions resulting from rephrasing of questions, intonation of voice and other interviewer generated biases; c) when interviewing a household in which some members are not available to reply, the ages and sexes of these persons should be recorded. This information will be used later in analyzing the responses.

4. Expected response rate: (depending on time of day) 60-80%

C. Door to Door

1. Requirements: a) this is a time consuming and often costly method of surveying; however, it provides the most reliable results. Both time and manpower requirements with this method are high; b) careful organization will help simplify the application of this technique.

2. Advantages and limitations of house to house surveys are in many ways similar to those of telephone surveys except that somewhat more organizational effort is required to successfully administer this type of survey.

3. Expected response rate: (depending of time of day) 60-80%

D. Surveys of School Age Children

The major advantage of surveying school age children lies in the fact that these surveys can be administered to groups thus saving both time and expense. Since these surveys will help determine the needs of the most vulnerable groups of bicycle users, the results obtained from them will be especially valuable.

1. Advantage: very high response rate; easy to administer.

2. Disadvantages: cover only a portion of cyclist population.

E. Newspaper Surveys

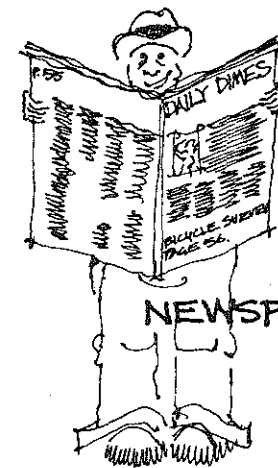
These have been used in some areas to measure demand for bikeways. The DPW does not recommend this technique as a means of gathering accurate information on bikeway demand. However, the public relations value of a newspaper or radio poll should not be discounted and may be used to support information gathered through other techniques.

Bicycle Rider Surveys

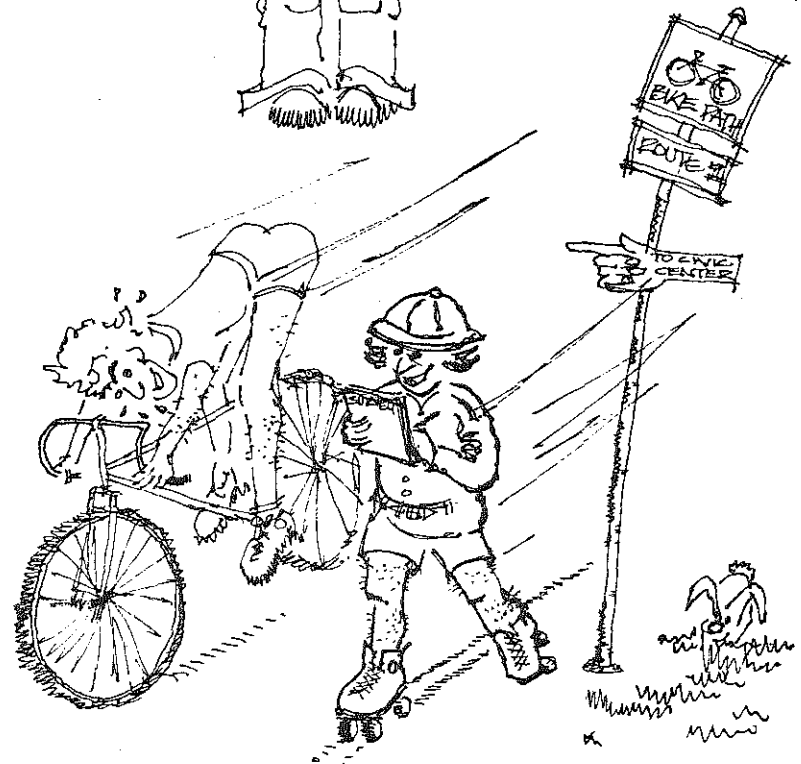
In order to measure the intensity of bicycle usage on selected streets, bicycle traffic surveys can be used. Two techniques are available. One is the corridor count. This is a limited technique that offers only numerical data. A more elaborate but much more useful technique is the user street survey which offers information not only about existing use patterns but also about preferences of users as well as perceived risk and frequency of use for a given route or activity.

A. Bicycle Traffic Counts

1. Requirements: a) should be conducted along routes determined from preliminary information on usage provided by citizen advisory groups, RPAs and DPW; b) counts should be conducted simultaneously on all routes being surveyed; c) counts should be taken on two separate days to eliminate day to day variations.
2. Advantages: a) inexpensive; b) offers accurate image of current usage.
3. Limitations: a) it will be necessary to recruit volunteers to help man the counting posts since a number of sites will need to be monitored simultaneously; b) although useful, traffic counts only provide numerical data and do not deal with the important questions of perceived risk, preferences and desires of cyclists.



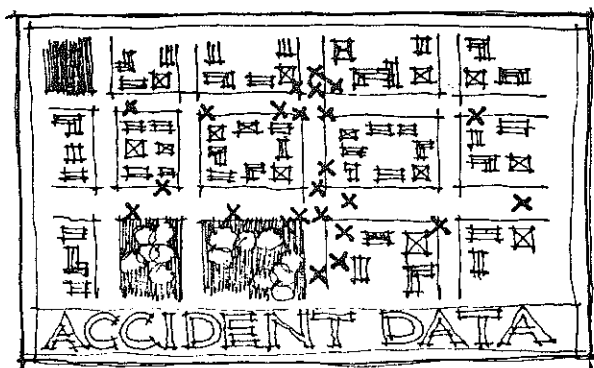
NEWSPAPER SURVEYS



BICYCLE RIDER SURVEYS

RIDER SURVEYS

BICYCLE TRAFFIC COUNTS



MAPPING ACCIDENT DATA

B. Rider Surveys

1. Requirements: a) this technique can be used in conjunction with bicycle counts or applied separately; b) rider surveys should be conducted along routes determined from preliminary information provided by the CAGs, RPAs and DPW consultants.
2. Advantages: a) technique can provide very valuable information about origins and destinations of cyclist trips, perceived risk of travelling certain routes, as well as insights into local bicycling problems and their possible solutions which only a cyclist can provide.
3. Limitations: a) this method of gathering data will often require recruitment of volunteer help and thoughtful organization of the work.

ACCIDENT DATA

The third type of information to be gathered deals with the location of bicycle accidents in the study area. This information will be available from the local and state police and will need only be colated for analysis. The following information about bicycle accidents will be needed.

1. Location of accident (as exact as possible)
2. Time of day
3. Day, night, dusk
4. Involving:
 - a. automobile
 - b. road hazard
 - c. no discernable cause of equipment failure
 - d. pedestrian

6

5. Road condition

- a. dry
- b. wet
- c. slippery (ice)

6. Traffic regulations violated (if any)

- a. by auto driver
- b. by bicycle rider

7. Age of cyclist

8. Sex

9. Type of bicycle

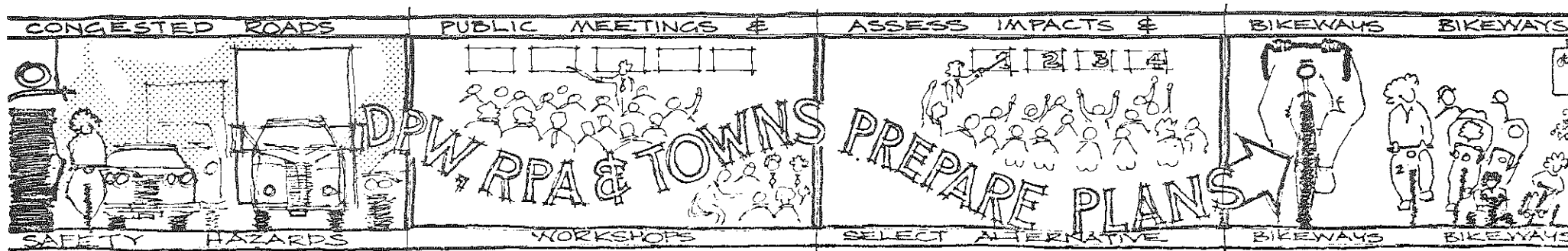
- a. childrens
- b. one speed
- c. three speed
- d. ten speed

10. Extent of injury (if any)

ACCIDENT DATA INDICATES POINTS
OF CONFLICT & AREAS OF HIGH
USAGE

APPENDIX

Included in this appendix is a description of the Inventory Methodology, the Updated Bikeways Inventory and a proposed inventory procedure for future work.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75

F

BIKEWAYS INVENTORY

INTRODUCTION

Prior to UMass involvement in Bikeways Planning through this study, the DPW had sent an inventory questionnaire to all the towns in Massachusetts and, as a result, published a list of the proposed and existing bicycle facilities in the state. (MDPW, Introduction to Bikeways in Massachusetts, June 1974, pp. 10 and 11) (See Appendix G) Although this provides an indication of what facilities exist and are being planned in Massachusetts, little detailed information about these facilities is included, and it is therefore not suitable for use by the DPW Bikeway Planners.

As established through discussions with the DPW liaison, the primary purpose of the UMass inventory is to provide more explicit information about existing and proposed bikeways in Massachusetts and present this information in concise and easily used format. To achieve this, the following procedure was employed.

INVENTORY METHODOLOGY

1. Analyze and Collate the Information Previously Collected by the DPW

This involved organizing the material left by the part time bikeways consultant previously employed by the DPW which included reports describing the work of other state agencies (e.g., MDC, DNR), results of the 1973/1974 bikeways inventory and all the available correspondence regarding bikeways between the towns and the DPW. The relevant material included in these files was then abstracted and synthesized into a very simple inventory

summary form. The format used was designed to enable the DPW personnel to rapidly refer to a particular region and town without having to read all the correspondence previously received and to continually update the inventory as necessary.

2. Contact the Bicentennial Commission

Peter Dimond, who is currently working on a bikeways report for the Bicentennial Commission and DPW, has recently compiled an inventory of all the existing and proposed bikeways in Massachusetts (See Appendix G). As his methodology was similar to the one proposed by this group, it was possible to short-circuit the process. The inventory which was compiled from information supplied by the regional planning agencies provided a valuable reference and the relevant information was included in the inventory being compiled by the UMass team.

3. Develop Inventory Questionnaires

There was some confusion caused by the inventory questionnaire previously used by the DPW. Many towns answered the cover letter and not the form and others became confused as questions were asked on both the cover letter and the questionnaire. This confusion may have caused many towns not to respond. Therefore, a new inventory procedure was required. The system adopted is a two phase process, involving two questionnaires. The first questionnaire is to be sent to all the towns in Massachusetts and is simply to ascertain if a town has any existing or proposed bikeways. Several questions included require answers from towns without any bicycle facilities and therefore, all towns should respond to the questionnaire. It is designed to take little specialized knowledge and approximately five minutes to answer and, as a result, should receive a high level of response. The second questionnaire is more comprehensive than the first, will take approximately 50 minutes to answer and is aimed at providing very detailed information about existing bikeways. It is to be sent to towns having previously indicated that they have existing or proposed bicycle facilities.

4. Application of the Inventory Questionnaire

The UMass Bikeways Group originally intended to send the questionnaires discussed above to each town in Massachusetts and collate the information received. However, following discussions with the DPW liaison and as indicated in the November Progress Report, it was decided that it would be inadvisable to proceed with this at the present time. This judgement was based upon the response to the previous questionnaire and all subsequent correspondence in which the majority of the towns requested planning information and various other types of assistance. As the DPW had not been in a position prior to the UMass/DPW contract to provide the necessary advice and assistance to the towns and has still not responded to the towns' requests, it was thought to be unwise to request further information from them. Thus, the decision was simply a tactful maneuver to prevent alienating the towns from the DPW. A further consideration when making this decision was the detailed inventory already prepared by the UMass team which is adequate for future bikeways work until detailed planning work is embarked upon in a particular region, when more information would be required.

PROPOSED METHODOLOGY FOR FUTURE BIKEWAYS INVENTORIES

Prior to beginning the first update of the inventory, the DPW should provide each town with the bikeways planning publications prepared by the UMass Bikeways Team for public informational purposes. These publications were prepared to answer the majority of the questions previously asked by the town officials and community groups.

The following is the recommended sequence for updating the bikeways inventory:

1. Distribute the first above mentioned questionnaire to all the towns in Massachusetts, together with a self-addressed prepaid envelope and a cover letter explaining the purpose of the questionnaire and acknowledging that they may have previously answered a similar questionnaire. Such a letter should state the following:

- a. That the DPW is interested in helping local communities to establish bikeway systems but all inquiries and requests for assistance must be directed through the regional planning agencies.
 - b. That the DPW has prepared several publications about bikeways planning. If the towns have not already received these, they should contact the DPW.
 - c. That the return of the completed inventory questionnaire will assist the DPW in developing a safe bicycle network in Massachusetts.
 - d. The due date for return of the questionnaire (allow approximately three weeks).
 - e. It is also important to stress that the questionnaire will take only five minutes.
 - f. A name and telephone number should also be included to enable clarification of any ambiguities.
3. One week prior to the due date for return of the questionnaire, a reminder should be distributed to all the towns which have not yet answered. In this letter, every means of persuasion should be used to encourage the towns to respond to the questionnaire. Perhaps a reference to the fact that the response or lack of response may effect future plans and funding in the region may be a good idea. Towns without bicycle facilities should also be reminded that they too are expected to reply. Another copy of the questionnaire should also be sent with this letter.
 4. Approximately three weeks after the due date, the results should be tabulated.
 5. The second questionnaire should be sent to the towns with existing or proposed bikeway facilities together with a cover letter and a self-addressed prepaid envelope. As part of the second questionnaire, the recipients are asked to map

existing and proposed bicycle facilities in their town. To insure that all these maps are a suitable and common scale, a map of each town should be included with the questionnaires and sent to the respective towns.

6. A follow up letter similar to the one described above (step 3) should be sent to all the towns.
7. After allowing a reasonable period for return of the questionnaires, the information should then be collated and summaries prepared.
8. A draft copy of the inventory together with maps showing each town should then be prepared.
9. The preliminary inventory should then be distributed to all the towns in Massachusetts requesting them to inform the DPW of any inaccuracies.
10. The bikeways inventory should then be published.

BIKEWAYS INVENTORY

LEGEND

"X" indicates yes or a positive response.

Under "type" (i.e., type or classification of bikeway) the following symbols are used:

A blank is a negative response or no response.

"pth" indicates a bikepath.

"lne" indicates a bikelane.

"rte" indicates a bikeroute.

"biw" indicates a biwalk.

The length is indicated in miles and width in feet.

Under "surface" which refers to type of paving surface:

"bit" indicates bitumin.

"con" indicates concrete

"gvl" indicates gravel.

"cly" represents compacted clay or earth.

"stn" indicates cinder or crushed stone.

The maintenance responsibility is indicated by the initials of the agency or town involved:

"DPW" - Department of Public Works

"DNR" - Department of Natural Resources

"MDC" - Metropolitan District Commission

"PS" - U.S. Park Service.

"Tn" - Town.

"CE" - U.S. Corps of Engineers.

If an "X" is recorded under "preliminary planning stage only", it indicates that planning has just begun and that a definite proposal does not exist.

An "X" recorded under "interest groups" means that a particular interest group was mentioned in the correspondence.

BERKSHIRE COUNTY REGIONAL PLANNING COMMISSION - 1

NAME OF TOWN OR CITY	RESPONSE TO QUESTIONNAIRE	EXISTING BIKEWAYS					PROPOSED BIKEWAYS					USE OF SIDE-WALKS PERMITTED	REGISTRATION PROGRAM	REQUEST FOR PLNG ASSIST.	INTEREST GROUPS	ADDITIONAL REMARKS
		TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY	PRELIM. PLNG STAGE- ONLY	TYPE	LENGTH	WIDTH	SURFACE					
Adams	X												X	X		
Alford																
Becket																
Cheshire	X													X		
Clarksburg																
Dalton																
Egremont																
Florida																
Great Barrington																
Hancock																
Hinsdale																
Lanesborough																
Lee																
Lenox																
Monterey																
Mt. Washington																
New Ashford																
New Marlborough																

BERKSHIRE COUNTY REGIONAL PLANNING COMMISSION

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FRANKLIN COUNTY DEPARTMENT OF PLANNING

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LOWER PIONEER VALLEY REGIONAL PLANNING COMMISSION - 3

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LOWER PIONEER VALLEY REGIONAL PLANNING COMMISSION

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LOWER PIONEER VALLEY REGIONAL PLANNING COMMISSION

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MONTACHUSETT REGIONAL PLANNING COMMISSION - 4

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CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION-5

NAME OF TOWN OR CITY	RESPONSE TO QUESTIONNAIRE	EXISTING BIKEWAYS					PROPOSED BIKEWAYS					USE OF SIDE-WALKS PERMITTED	REGISTRATION PROGRAM	REQUEST FOR PLNG ASSIST.	INTEREST GROUPS	ADDITIONAL REMARKS
		TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY	PRELIM. PLNG STAGE ONLY	TYPE	LENGTH	WIDTH	SURFACE					
Auburn																
Barre	X													X		
Berlin	X															
Blackstone																
Boylston																
Brookfield																
Charlton	X															
Douglas	X															
Dudley																
East Brookfield																
Grafton																
Hardwick	X															
Holden	X						X							X		New roads to have Bikeways
Hopedale																
Mendon	X													X		
Millbury	X	rte.					X							X		Intend to register bikes & develop plans.
New Braintree																
Northbridge																

CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION

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MERRIMACK VALLEY PLANNING COMMISSION-7

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METROPOLITAN AREA PLANNING COUNCIL - 8

NAME OF TOWN OR CITY	RESPONSE TO QUESTIONAIRE	EXISTING BIKEWAYS					PROPOSED BIKEWAYS					USE OF SIDE-WALKS PERMITTED	REGISTRATION PROGRAM	REQUEST FOR PLNG ASSIST.	INTEREST GROUPS	ADDITIONAL REMARKS
		TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY	PRELIM. PLNG STAGE ONLY	TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY				
Acton	X													X	X	Considering stencils on telephone poles
Arlington																
Ashland	X													X		
Bedford	X	biw			stn											Former R.R. r.o.w.
Belmont	X															
Bellingham																
Beverly																
Boston		pth	2			MDC	X									Charles River Bikepath
Bolton																
Boxborough																
Braintree	X						X							X		
Brookline							X									
Burlington	X													X		
Cambridge		rte	6		bit	DPW								X		
Canton	X						X						X			Considering us of utility easements.
Carlisle																
Chelsea	X													X		
Cohasset	X						X	pth	5					X		R.R. right of way

METROPOLITAN AREA PLANNING COUNCIL

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METROPOLITAN AREA PLANNING COUNCIL

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METROPOLITAN AREA PLANNING COUNCIL

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METROPOLITAN AREA PLANNING COUNCIL

NAME OF TOWN OR CITY	RESPONSE TO QUESTIONNAIRE	EXISTING BIKEWAYS					PROPOSED BIKEWAYS					USE OF SIDE-WALKS PERMITTED	REGISTRATION PROGRAM	REQUEST FOR PLNG ASSIST.	INTEREST GROUPS	ADDITIONAL REMARKS
		TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY	PRELIM. PLNG STAGE ONLY	TYPE	LENGTH	WIDTH	SURFACE	MAINTENANCE RESPONSIBILITY				
Salem								rte	4							Completion Summer 1975
Saugus																
Scituate								pth	15							
Sharon	X							pth	6							Borderland St. Park
Sherborn	X															
Sherbrooke																
Somerville																
Southborough																
Stoneham																
Stoughton																
Stow	X						X	pth	4							Recreation Comm. has requested funds.
Sudbury		biw	7					biw	5							Already funded
Swampscott																
Topsfield																
Wakefield																
Walpole																
Waltham	X						X	biw				No		X		
Watertown	X	biw	0.3		bit	MDC	X							X		Considering use of B&M RR right of way.

METROPOLITAN AREA PLANNING COUNCIL

[illegible]

OLD COLONY PLANNING COUNCIL-9

[illegible]

SOUTHEASTERN REGIONAL PLANNING AND ECONOMIC DEVELOPMENT COMMISSION - 10

[illegible]

SOUTHEASTERN REGIONAL PLANNING AND ECONOMIC DEVELOPMENT COMMISSION

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-11

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AND NANTUCKET COUNTY - 12.

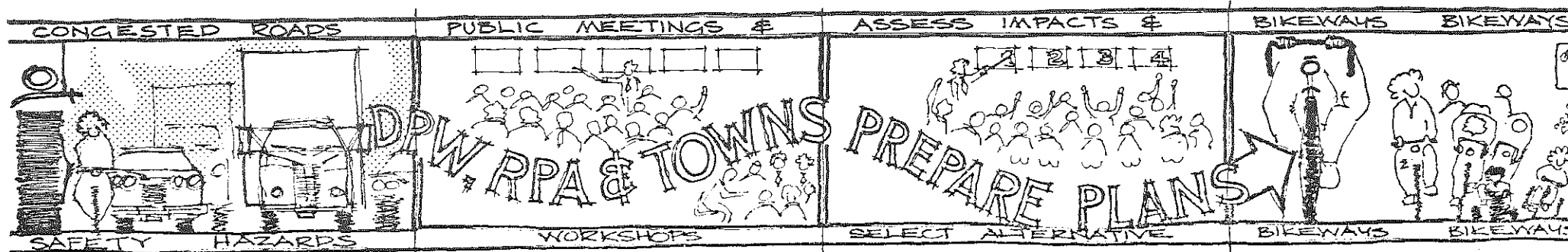
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TOWNS NOT ASSIGNED TO PLANNING COMMISSIONS

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APPENDIX

Included in this appendix is the bikeways inventory conducted by the DPW (1974) and the bikeways inventory for Massachusetts compiled by the Bicentennial Commission.



The following is the Final Summary of the 1973-74 Bikepath Inventory as conducted by the DPW as published in "Introduction to Bikeways in Massachusetts" (1974):

MARCH 13, 1974 - FINAL SUMMARY - BIKEPATH INVENTORY

BTP&D - DEPARTMENT OF PUBLIC WORKS

As of March 13, 1974, the Bureau of Transportation Planning and Development had received 159 replies from municipalities.

No replies were received from the other municipalities, but where we knew of others they were included in the list and marked on the map.

The following municipalities indicated that they have no provisions or plans for bicycle paths. Most of them indicated an interest in state funding and advice on planning.

Berkshire Regional Planning Commission

Adams	Alford	Cheshire	Clarksburg
Hinsdale	Hancock	Mt. Washington	North Adams
Sandisfield			

Franklin County Department of Planning

Ashfield	Buckland	Erving	Gill
Greenfield	Northfield	Shelburne	Whately

Lower Pioneer Valley Regional Planning Commission

Blandford	Brimfield	Chester	Chesterfield
Goshen	Granby	Hadley	Longmeadow
Pelham	Southwick	Williamsburg	East Longmeadow

Central Massachusetts Regional Planning Commission

Barre	Berlin	Brookfield	Charlton
Hardwick	Mendon	Northborough	Princeton
Rutland	Upton	West Boylston	

Northern Middlesex Area Commission

Dracut	Dunstable	Tewksbury	Westford
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Merrimack Valley Regional Planning Commission

Boxford	Methuen	Newbury	Newburyport
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Metropolitan Area Planning Council

Ashland	Burlington	Danvers	Dedham
Duxbury	Hamilton	Hull	Littleton
Lynnfield	Marlborough	Medfield	Medway
Melrose	Needham	Norfolk	North Reading
Pembroke	Waltham	Westwood	Weymouth
Wrentham			

Old Colony Planning Council

Bridgewater	Easton	Abington
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Southeastern Regional Planning and Economic Development
Commission (SRPEDC)

Acushnet	Halifax	Kingston	Lakeville
Marion	Plympton	Rochester	Middleborough

Cape Cod Planning and Economic Development Commission

Chatham	Eastham	Orleans	Wellfleet
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Unassigned

Groton	Hopkinton	Petersham
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The following municipalities have plans for regional and local bicycle facilities under consideration:

Berkshire Regional Planning Commission

Williamstown -- signed route, part of inter-municipal system

Franklin County Department of Planning

Montague -- Recreational, power line right of way

Lower Pioneer Valley Regional Planning Commission

Amherst -- Separate paths, lanes and signed streets
Holyoke -- Recreational paths
N. Agawam -- Paths in new development
Northampton -- Signed streets and lanes
Palmer -- Recreational paths in park
West Springfield -- Park route

Montachusett Regional Planning Commission

Winchendon -- Separate paths in parks

Central Massachusetts Regional Planning Commission

Holden -- Separate paths and lanes
Millbury -- Signed streets and sidewalks
Worcester -- Overall city plan in progress

Northern Middlesex Area Commission

Merrimack Valley Regional Planning Commission

Metropolitan Area Planning Council

Braintree -- Recreational paths in park
Brookline -- Marked lanes
Canton -- Gasline easements
Marblehead -- Signed streets and railroad bed

Maynard -- Separate paths
Medford -- Park path MDC
Newton -- Marked paths, signed streets
Norwood -- Park path
Rockland -- Separate pedestrian and bikeways
Sharon -- Signed streets
Somerville -- Signed streets and separate paths
Stow -- Overall plan in progress
Wayland -- Separate sidewalks

Old Colony Planning Council

SRPEDC

Dartmouth -- Signed streets and separate path
Fairhaven -- Abandoned railroad right of way
Marion -- Overall plan in progress
Mattapoisett -- Abandoned railroad right of way

Cape Cod

Barnstable -- Paths, street lanes and signed routes
Dennis -- Signed streets and abandoned railroad right of way
Falmouth -- Abandoned railroad right of way
Harwich -- Abandoned railroad right of way
Orleans -- Abandoned railroad right of way
Yarmouth -- Paths, signed streets and lanes

Dukes County

Overall plan by DCPEDC

Several municipalities reported that they have local facilities already completed, and several of these plan expansion. These communities include:

Berkshire Regional Planning Commission

Stockbridge -- Recreation, signed streets

Lower Pioneer Valley Regional Planning Commission

Springfield -- Recreation streets in park; unmarked bike corridors

Montachusett Regional Planning Commission

Gardner -- Unimproved railroad right of way

Metropolitan Area Planning Council

Acton -- Recreational signed street
Bedford -- Recreational abandoned railroad right of way
Cambridge -- Signed streets
Ipswich -- Marked streets and abandoned railroad bed
Boston -- Recreational, separate paths and signed streets
Lexington -- Separate paths in park
Lincoln -- Separate paths along streets
Malden -- Separate paths and routes in parks
Millis -- Marked street
Peabody -- Abandoned railroad bed
Watertown -- MDC sidewalks and signed streets
Wellesley -- Park routes and unimproved aqueduct

Old Colony Planning Council

Brockton -- Recreational, separate paths and signed streets

SRPEDC

Fall River -- Recreational, historical tour, unsigned streets
New Bedford -- Signed streets
Norton -- Recreational, abandoned railroad bed
Swansea -- Signed streets
Taunton -- Marked roads

Cape Cod

Bourne -- Corps of Engineers
Cape Cod Canal service road
Mashpee -- Signed streets

Nantucket

Sidewalk on road.

The following information has been gathered by the Metropolitan Area Planning Commission and represents existing bikeway facilities in their district as of the summer of 1974.

Beverly - Eighteen miles of bikeroutes on local roads is planned in celebration of the bicentennial. The route will be a loop connecting scenic, historic and recreational areas, and will allow for future regional connections with Manchester, Danvers and Salem.

Boston - 1) Dorchester Bay Bikepath: 8.0 miles of bikepaths were proposed by the Boston Redevelopment Authority in 1972 mostly on Metropolitan District Commission (MDC) land. Administrative and technical difficulties defeated the path, but the area along the Bay remains an attractive location for a bikepath.

2) Neponset River Bikepath: 6.0 - 8.0 miles of bikeways have been proposed by the Neponset Conservation Commission from just west of Neponset Traffic Circle to the Blue Hill Reservation Trailside Museum. The proposed path would be mainly bikepaths although it would occasionally be a bikelane or bikeroute where there is no room along the river for a bikepath. The banks of the Neponset offer one of the most outstanding locations for a scenic bikepath in Boston and could provide safe access for bicyclists from Boston to the 6,000 acre reservation.

3) Charles River Bikepath: 2.0 miles of bikepath built two years ago and named after Dr. Paul Dudley White have become a popular bicycling route. The MDC plans to extend this path past the Boston University bridge to Brighton closing one lane of Storrow Drive into the riverbank park in order to make room for the bikeway. On the Cambridge side, 4.0 miles of bikepath exist and the MDC plans to extend the path to Watertown Square.

4) Green Belt Bikeway: Two years ago, the Boston Parks and Recreation Department designated highways along the

Olmstead Park system as bikeroutes. The route proved dangerous south of Commonwealth Avenue and the signs were dismantled. Construction of a safer bikeway is on the MDC's list of future priorities.

Brookline - Two and one half miles of bikelanes for commuters along Beacon Street is proposed by the Traffic Department. The bikelanes would be marked on the pavement 4-5 feet outside the parking lane.

Cambridge - 1) Seven miles of bikeroute exists with "Bike Route" signs posted along the curb from Fresh Pond to Longfellow Bridge on the Charles River.

2) As an alternate approach to encouraging the urban bicyclist, the Cambridge Planning Department is planning an extensive system of theft-proof bike racks at many of the major squares and community centers in the city.

Cambridge-Boston-Brookline Pilot Route -

The State Department of Public Works is coordinating a 9.5 mile bikeroute through Boston from Cambridge and Brookline for bicycle commuters.

Canton - Eleven miles of gas and electric utility easements criss-cross the town and have been proposed as a bikepath location. Paths would link several schools and recreation facilities.

Carlisle - Fifteen miles of biwalks radiating out from the center of town to connect schools and recreation areas were proposed in a November 1973 Path Committee report. The proposal would have phased construction over 15 years starting with an initial 1.5 mile model path along Bedford Road, a heavily used thoroughfare. However, a Spring 1974 town meeting did not approve funding for the model path and the proposal's future is uncertain.

Cohasset - Five miles of bikepaths have been proposed for the abandoned New York-New Haven railroad bed. The town is negotiating to buy the right-of-way, linking schools and commercial and recreation areas. An interconnecting system of spur routes is included in the plans.

Concord - The feasibility of a bicycle path system through the town center is under study. Outside of the town center, bicycles are encouraged on sidewalks, and money is budgeted annually to extend the sidewalk system. Bicycle facilities for the entire town are currently under study by the League of Women Voters.

Concord-Lincoln-Wayland Route 126 Bikepath -
Eight miles of bikepath are proposed along Route 126 connecting historic and recreational areas. A committee from the three towns has applied for DPW funding.

Hingham - 1) Sixteen miles of paved bikepaths through 3,000 acre Wampatuck State Park were constructed by the Department of Natural Resources (DNR) in 1973.

2) One and one half miles of bikeways are proposed to provide safe access to Wampatuck State Park.

3) Mainside Park, a former naval reservation, is now a 460 acre town-owned park, and plans are being developed for a system of bikepaths within the park.

Lincoln - Four and one half miles of bikepaths and bikeways connect schools, residential and commercial areas. One of the first and best known bikeway systems in Massachusetts, the paths are often separated from the road by trees or stone walls to preserve scenic values.

Lynn - Three miles of paved bikepaths are proposed as part of general improvements to the 100 acre Lynn Woods by the Lynn Park Department. Existing trails are unpaved and in poor condition. A bikeway system was proposed for the entire city, but cost and construction difficulties defeated the proposal.

Marblehead - Two and one half miles of unpaved bikepaths exist on a town-owned abandoned railroad bed linking three major conservation areas. The parks and recreation commission plans to designate both the railroad bed and 7.5 additional miles of streets by the end of the year as official bikeways. The routes connect schools, conservation and recreation areas in the seacoast town.

Medfield - An extensive network of bikeways has been proposed in a recently completed recreation plan for the town. The routes would link schools and conservation areas.

Medford - Two miles of bikepaths are planned by the MDC in its Mystic River Reservation. Ultimately, bikepaths may stretch upriver to the Mystic Lakes.

Millis - Five and one half miles of bikeroute exist along country roads and are signed at all intersections. The bikeroute was designated by the Recreation Department in 1972.

Milton - Eight miles of bikepaths and bikelanes are proposed to link schools and recreational areas within the town.

Newton - 1) A 13.0 mile bikeroute loop is planned as a bicycle tour linking parks and historic areas with Newton's unique village centers. A second loop route is proposed for the northern part of town.

2) A 4.0 mile bikelane principally for commuters is proposed for the carriage road which parallels Commonwealth Avenue. This bikelane may connect with the planned commuter route through Brookline into Boston. Plans call for two separate one-way bikelanes on the carriage road with accompanying proposals to discourage fast through traffic.

Peabody - A 1.5 mile signed bikepath on an unpaved abandoned railroad bed exists. A proposed addition would continue eastward 1.5 miles into Peabody center along the same route in conjunction with a new sewer easement. The railroad is still active to the west.

Quincy - Two miles of bikepaths and bikelanes is proposed through Merrymount Park and across Black's Creek to Morrissey Boulevard. A second 3.0 mile bikelane is proposed out to Hough's Neck.

Salem - Four miles of bikeroute is planned in celebration of the bicentennial in this historic seacoast town. The loop route

will guide bicyclists to parks, museums, a state college and sections of the old waterfront. Signs should be in place by the summer of 1975.

Scituate - Six miles of bikepath have been proposed for the abandoned New York-New Haven railroad bed which is owned by the town. A 1974 recreation study proposes 9.0 additional miles of bikepath and bikelane to link recreational and scenic areas. The 15 mile system would link major commercial and recreation areas in the South Shore town.

Sharon - Six miles of bikepaths are proposed around Lake Massapoag and south toward Borderlands State Park. One section may use an existing road for bicycle and pedestrian traffic while relocating the auto road slightly farther back from the lake.

Stow - Four miles of biwalk along Route 117 through the town is proposed by the recreation commission. The paths would provide access to several schools and commercial areas. Future plans may include paths along Route 62 with regional connections to Maynard, Bolton and Hudson, as well as paths in less developed areas of town.

Sudbury - Seven miles of biwalks have been constructed with an additional five miles funded and five more miles in planning stages. On one side of the road only, they connect schools, recreational and commercial areas.

Wayland - An eight mile system of biwalks exists, with five additional miles proposed. The biwalks connect schools and recreation areas, are five feet wide and are set back a minimum of three feet from the roadway.

Wellesley - Two miles of unpaved bikepaths run along Fuller Brook connecting schools and recreational areas. Nearly 20 miles have been proposed along aqueducts and through park areas.

Wenham - One and one half miles of biwalks have been completed of a 2.25 mile network planned for a residential section of

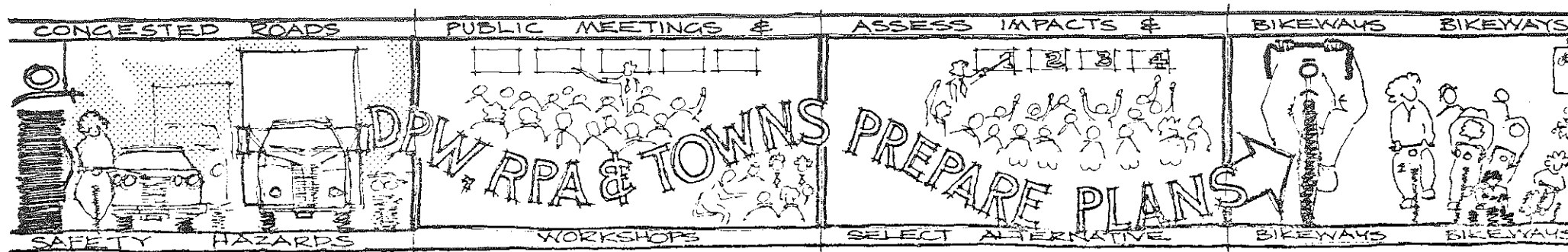
Wenham. The path generally follows streets, but meanders behind trees and other vegetation.

Woburn - Two miles of bikepaths are proposed along sections of the old Middlesex Canal, which once ran from the Merrimac River to Haymarket Square. The canal is now mostly empty and in many places completely non-existent, but some overgrown sections still exist in Woburn. The Woburn Canal Society hopes to construct a bikepath along these sections.

Winchester - Bikepaths have been proposed as a bicentennial project.

APPENDIX

Included in this appendix is the DPW State Bikeways Plan (1975).



LONG RANGE DPW BIKEWAYS PLAN

There is increasing evidence that any serious proposal for a coordinated, energy-efficient transportation system must include bicycles. To misinterpret the growing demand and interest in bicycles as a passing fad, or as the pre-occupation of a vocal but small group of enthusiasts would be a costly error. Given the proper facilities, the bicycle represents an important alternative to the automobile for those transportation uses in which the automobile is highly inefficient and in fact produces negative side effects. It must be recognized that there is more than mere coincidence involved in the concurrent rise of both energy costs, specifically gasoline prices, and demand for bicycles.

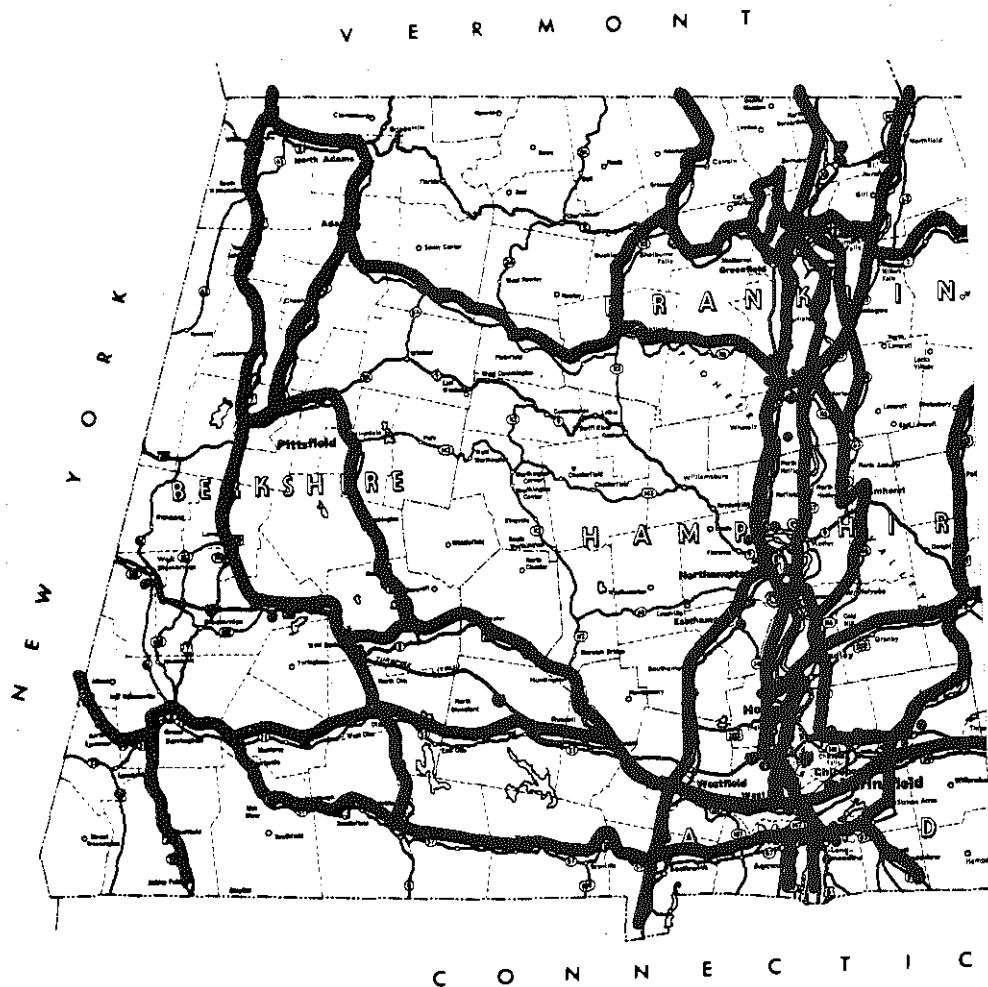
Responding to this need for proper bicycle facilities, the Massachusetts Department of Public Works has developed a set of long range Regional plans for bikeways. The formulation of these projects involved the active assistance of the transportation planners in the Regional Planning Agencies. Their contribution consisted of information and recommendations based on requests made to the Regional Planning Agencies by the communities in their region. Also, the Regional Planning Agencies have the most comprehensive knowledge of their regions and therefore are in a unique position to assist in the initiation of the plans and the planning process.

Cost estimates have not been calculated since these regional plans are preliminary in nature, and it is expected and desired that additions and improvements will be proposed as time goes on. It is also important to note that these plans represent only "corridors", not assigned routes. Thus, there exists a great deal of flexibility in these plans which can be utilized to advantage in finding the safest, most convenient, most cost-efficient routes possible within each region.

Finally, these region-wide plans played a vital role in the formulation of a state-wide plan of proposed bikeway corridors. As with the region-wide plans, the state-wide plan was developed in cooperation with the Regional Transportation Planners. In fact, the state-wide plan is principally composed of information derived from the region-wide plans. Additional information was also obtained from municipalities and other interested groups. The main objectives of the state-wide plan was to identify any omissions, from the regional plans, of possible connecting routes; as well as, to propose reasonable corridors for inter-regional and possible inter-state linkages.

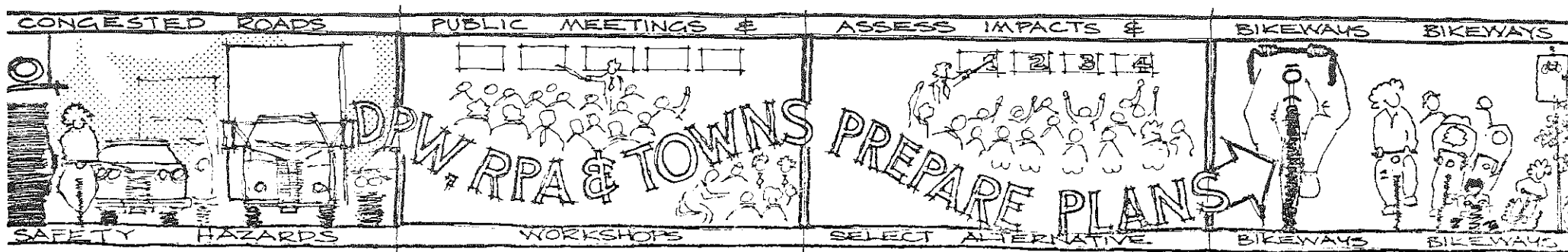
In this way, the regional plans were drawn together to form a comprehensive system of bikeways across the state.

Thus, over the long-term, a portion of the total transportation needs in the State of Massachusetts could conceivably be satisfied through planning for the bicycle on a region-wide and state-wide basis.



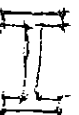
APPENDIX

Included in this appendix is a list of firms and individuals who have contributed to the success of our efforts. The list covers a broad range of expertise from individuals with very specialized skills to large firms and planning agencies which have developed comprehensive plans for entire cities and regions. It is our hope that other persons working in the field of bikeway planning will find these individuals and agencies useful sources of guidance and helpful information.



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BIKEWAYS PLANNING INFORMATION APRIL '75



American Association of State Highway and Transportation Officials
341 National Press Building
Washington, DC 20004

-Prepared an engineering guide for bikeway planning entitled
"Guide for Bicycle Routes".

Greater Boston Council of American Youth Hostels
Ms. Kathie Hammond
251 Harvard Street
Brookline, MA 02146

-Information about bicycle touring routes in New England.

City of Ann Arbor
Planning Department
Haldon L. Smith
Ann Arbor, MI 48108

-Prepared Ann Arbor Bicycle Path Study.

Arnold Associated
20 Nassau Street
Princeton, NJ 08540

-Prepared bikeway planning report for Princeton, New Jersey.

Barton-Aschmann Associates
1821 University Avenue
Saint Paul, MN 55104

-Prepared Atlanta Metropolitan Regional Bikeway Plan.

Ms. Marie E. Birnbaum
Environmental Programs Coordinator
U.S. Department of Transportation
Assistant Secretary for Environment, Safety and
Consumer Affairs Office
1626 K Street, NW
Washington, DC 20006

-Author of several papers about bikeways and their potential.

Professor William Boyer
Department of Civil Engineering
Marston Hall
University of Massachusetts
Amherst, MA 01002

-Professor of Civil Engineering; on-line retrieval system for transportation planning information.

Mr. James Braman
Director of Community Planning
City of Seattle
Seattle, WA 98104

-Prepared "Seattle: Comprehensive Bikeway Plan".

Mr. Phil Burke (Informational Services Director)
Bicycle Manufacturers Association
122 East 42nd Street
New York, NY 10017

-A source of audio-visual bikeway related materials.

Cambridge Community Development Department
Mr. Maurice V. Dullea
Cambridge, Massachusetts

-Prepared "Bicycle Parking in Cambridge" report.

Mr. Robert Cleckmer (Executive Director)
Bicycle Institute of America
122 East 42nd Street
New York, NY 10017

-Bicycle Manufacturers Lobby Group - much information available through them.

Mr. Walt Cudnhefsky (Director)
Conway School of Landscape Design
Conway, MA 01341

-Developed Greenfield Bikeway Plan.

Cyclists Touring Club
69 Meadow Street
Godalming, Surrey, ENGLAND

-English Bicycle Touring Group.

DeLeuw Cather and Company
120 Howard Street
San Francisco, CA 94120

-Preparers of "Bikeways: State-of-the-Art, 1974"; prepared
circulation and safety report for Davis, California.

Denver Planning Office
Mr. Frederick Wolf
1445 Cleveland Place
Room 300
Denver, CO 80202

-Prepared "Denver Bikeway Plan".

Mr. Peter Dimond
Massachusetts Bicentennial Commission
10 Tremont Street
Boston, MA 02108

-Bikeway Planner.

Professor Nicholas Dines
Department of Landscape Architecture and Regional Planning
Wilder Hall
University of Massachusetts
Amherst, MA 01002

-Landscape architect/planner.

Prof. Donald O. Doehring
Department of Geology
University of Massachusetts
Amherst, MA 01002

-Professor of Environmental Geology; Soil related problems
in bikeways planning.

Ed-Venture Bike Tours
Mr. Bruce Winn
P.O. Box 194
South Deerfield, MA 01373

-Operates a bicycle touring program in New England.

Dr. D.M. Eggleston
Department of Aerospace Engineering
California State University at San Diego
San Diego, CA 92115

-Prepared plans for adopting mass transit facilities to bicycling.

Friends of Bikecology
1035 East De-La-Guerra Street
Santa Barbara, CA 03103

-Active bicycle lobbying group.

Professor Ethan Gluck
Department of Landscape Architecture and Regional Planning
Wilder Hall
University of Massachusetts
Amherst, MA 01002

-Landscape Architect; public participation in planning process.

Hart, Krivatsky and Stubee
229 Jackson Street
San Francisco, CA 94111

-Prepared BART/TRAILS report for San Francisco area.

Ms. Beth Humstone
Agency for Development and Community Affairs
Montpelier, VT 05602

-Contact for all Vermont state agencies dealing with bikeway planning.

Interaction Associates
Mr. Michael Doyle
149 9th Street
San Francisco, CA 94103

-Facilitation of public participation in planning process.

Mr. Kieth Kingbay
Cycling Activities Manager
Schwinn Bicycle Company
1856 North Koster Avenue
Chicago, IL 60639

-Expert on all aspects of bicycling.

Mr. James Konski
133 Onandaga Street
Syracuse, NY 13202
-Bikeway engineer.

Lawrence and Johnson, Inc. (Landscape Architects)
Mill Way
Barnstable Harbor
Barnstable, MA 02830

-Prepared preliminary proposals for Cape Cod bikeways.

League of American Wheelman
5118 West Foster Avenue
Chicago, IL 60630

-Nationwide bicyclists organization.

Management Information Service
1140 Connecticut Avenue, NW
Suite 201
Washington, DC 20036

-Prepared report on planning and development of bikeway systems.

Ms. Heidi Marston
Merrimack Valley Regional Planning Commission
Haverhill, MA 01830

-Bikeway planner - Merrimack Valley Regional Planning Commission.

Metropolitan Association of Urban Designers and Environmental
Planners (MAUDEP)

Suite 804
15 Park Row
New York, NY 10038

-Intensely interested in bicycles and pedestrian circulation.

Miami Valley Regional Planning Commission

Mr. Eric Smith
Room 500
333 West First Street
Dayton, OH 45402

-Prepared regional bikeway plan for Miami, Ohio.

Mr. Paul Mushovic
Department of Public Works
Government of Guam
Agana, Guam

-Bikeway Planner

National Committee for Uniform Traffic Laws and Ordinances
Washington, DC

-Traffic regulations related to bikeways and bicycling.

National Technical Information Service
Operations Division
Sills Building
5285 Port Royal Road
Springfield, VA 22151

-Distributors of bikeway planning information published by
the federal government.

New Jersey Department of Transportation
Division of Planning and Research
135 Parkway Avenue
Trenton, NJ 08618

-Prepared report, "Bikeways for State Highways" in New Jersey.

North Carolina Department of Transportation
Mr. Curtiss B. Yates
Raleigh, NC 27603

-Prepared report "Bikeways for North Carolina".

Mr. Tom O'Leary and Mr. Tom Goff
County Planner's Office
32 Federal Street
Salem, MA 01970

-County planners for Essex County; developing bikeway plans
for that area.

Mr. Carl E. Ohrn
1821 University Avenue
Saint Paul, MN 55104

-Bikeways planner for Barton Aschman Associates; has written
several technical papers on the subject of bikeway planning.

Mr. Richard Podelske
1821 University Avenue
Saint Paul, MN 55104

-Bikeways planner for Barton and Aschman Associates; has
written several technical papers on the subject.

Sanborn, Stekette, Otis and Evans, Inc.
Libbey-Owens-Ford Building
Toledo, OH 43624

-Prepared Toledo area bikeway plan.

Synectics Education Systems
Mr. William Gordon
Cambridge, MA 02138

-Citizen participation in planning.

Synectics, Inc.
Ms. Kate Riley
26 Church Street
Cambridge, MA 02138

-Creative problem solving.
participation in planning.

Tempe Planning Department
P.O. Box 5002
Tempe, Az. 85281

-Prepared three volumes of bikeway planning reports between
1971 and 1974.

Tibbetts Engineering Corporation
620 Belleville Avenue
New Bedford, MA 02745

-Prepared preliminary engineering report for Mattapoisett,
Massachusetts bikeway proposals.

Mr. Ronald Tietgen
Department of Parks and Recreation
Viscaya Office
Miami, FL 33132

-Bikeway Planner in Dade County, Florida

Engineering Reports Group
School of Engineering and Applied Sciences
University of California at Los Angeles
Los Angeles, CA 90024

-source of information re: bikeway design standards
Urban Bikeways Design Competition

Mr. Lyle Brecht
Director of Information
U.B.D.C. National Headquarters
Building E-40, Room 250
Massachusetts Institute of Technology
Cambridge, MA 02139

-Can provide bibliographic information, summaries of conferences, regular newsletter and access to an international array of bikeway planning experts.

Mr. Zackary Zandler
Dukes County Planning and Economic Development Commission
Oak Bluffs, Martha's Vineyard Island
Massachusetts

-Planning official; developing bikeways plans for Dukes
County Massachusetts.